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THE SCHOOL-OPENING NUMBER

With the new school year in the offing, it is timely to think of the opening day.

Many shop teachers have their plans for the year fully prepared, others, for one reason or another, have postponed this necessary work until now. The time is growing short, the job has to be started at once if the school year 1936–37 is to be an improvement over the last one.

Effective teaching requires definite preparation. The first day lays the foundation for the rest of the year, hence, if the superstructure is to be good, the groundwork must be carefully and conscientiously laid. There is still time to do this preliminary work, but beware of procrastination.

The articles for this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION were specially chosen to be helpful to the teacher who is contemplating his work for the coming year. It is hoped that they will suggest things that the shop teacher will want to include in his plans for the future.

POSTERS

The publication of posters for the shop bulletin board has been resumed with this issue. Their use will help you keep your bulletin board alive. Display one poster for two weeks, then turn it and display the poster on the other side.

THIS MONTH'S COVER

The picture chosen for the cover of the school-opening number is one belonging to the lumbering series.

The scene shows a log ready for the saw which is to cut it into boards. The photograph was taken at the Hughes Sawmill in New Mexico.

Photo courtesy U. S. Forest Service.

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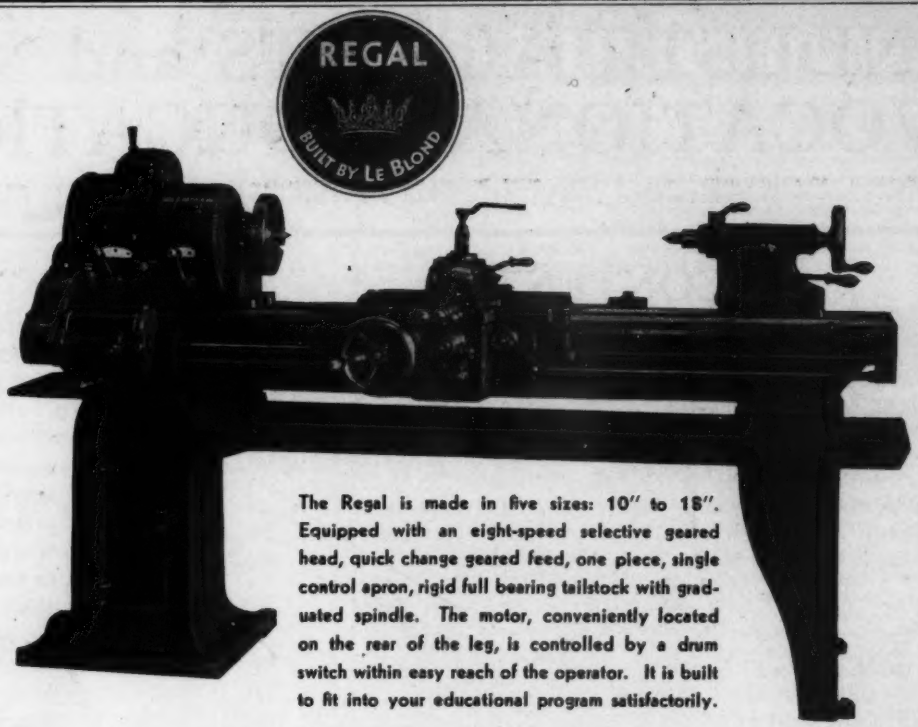

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

The Home-Workshop Organization

Ross C. Cramlet
Amos Hiatt Junior High School, Des Moines, Iowa

William L. Hunter
Iowa State College, Ames, Iowa

An article containing many practical hints for the shop teacher who wants to organize the home-workshop enthusiasts of his community.

The home-workshop movement is in the United States to stay. Homes of the future will be as incomplete without a workroom or a hobby room as they would be today without a kitchen. The average American may as well submit to the onward march of the machine age and decide that in this veritable "land of the free" he must learn to use the God-given leisure to some purpose. The commandment of old may eventually be rewritten to read: "One day shalt thou labor and do all thy work, but the rest of the week thou shalt use for thine own growth and development."

As increased numbers of men and women come to find enjoyment and creative outlet in the home workshop they will more and more want to join hands in a common enterprise. This is already beginning to take place in many cities, and no one even yet begins to dream of the extent of the movement in the future. The opportunity is here, and if the industrial-arts teacher does not take advantage of it, then some other group of persons will.

The purpose of this presentation is to give a few suggestions to any industrial-arts teacher who can read the handwriting on the wall and make an attempt to give direction and stability to the home-workshop movement.

Home-workshop members want to organize; they want to associate with others who have common interests; they want advice in regard to their problems; they want to share with others their joys in creation.

To be sure, the organization of this kind of group is not easy. It is beset with many obstacles, but the enthusiastic and competent industrial-arts teacher is the Moses to do the job, and he can if he but will.

One of the greatest obstacles to organization of the home-workshop group is the great variety of the group. One will find doctors, engineers, butchers, bakers, printers, painters, photographers, teachers, artists, lawyers; all classes of people according to vocation, financial status, age, and social standing. Truly, the organization of the home-workshop movement, if it succeeds, will become a great "melting pot of civilization." On first thought this variety of membership may appear to be insurmountable, but on second thought one realizes that when handled tactfully and diplomatically this great variety of interest, ability, and background really holds the keys to success of the home-workshop organization. In general, a human being, regardless of creed, vocation, or politics, wants to understand the other person, and he in turn wants to be understood.

What then are some of the keys to success in forming such an organization? First, the industrial-arts teacher must make a casual survey of his community. From his pupils, from talks with hardware dealers, from various contacts, he can determine approximately how many home members are interested in a home workshop. After he has satisfied himself that there are at least a dozen persons so interested, he can well count on that many more to become enthusiastic regarding the idea. Through newspaper announcements, notices sent home by boys, framed placards in hardware-store windows (see Fig. 1) he can initiate the plans for organization. The announcement in the paper can tell the purpose of the organization and perhaps give some indication of the educational values to be obtained. If the names of home workshop enthusiasts can be secured, one can send postal cards to them and invite them in turn to bring others who are likewise interested. Also a good man to contact is the dealer in home-workshop equipment. He will know of persons who are interested and will be glad to pass on the word of the formation of such an organization.

Fig. 1. The announcement

One long-time but fairly certain method of promoting the home-workshop organization is through the junior- and senior-high-school pupils now in the industrial-arts teacher's classes. If the pupils are encouraged to establish a home workshop; if near Christmas time mimeographed lists of sug-

gested tools are sent home by the boys to parents (it is surprising how many Christmas tools are bought for the boy when in reality it is the father who intends to use them); if a boy hobby show of objects made at home is featured once a year; and if the teacher makes it a practice to visit boy home workshops occasionally and give them suggestions, there will gradually be built up in the community a home-workshop consciousness.

Just what should take place at the first meeting of the home-workshop group? Obviously many things should not take place. Cut-and-dried lectures, involved parliamentary procedure, long-drawn-out debate, unnecessary time given to relating personal experiences, much red tape, and so on, will soon drive away any prospective members who have come. The very first meeting must be well planned to render service which one is pretty certain that the home-workshop member wants. If possible there should be a demonstration by an expert on some common home-workshop machine, perhaps the wood-turning lathe (see Fig. 2). Turning is most enticing to the average person who has recently purchased a lathe.

Fig. 2. A demonstration by a master

The selection of officers should be hurriedly but thoughtfully done. The possible officers of such an organization should be thought out ahead of time in consultation with a few of the most enthusiastic workshop members. There should be a president, vice-president, a secretary, and a publicity man. Later on need may be found for other officers or special committees. The president of an organization of this kind should be an individual who has considerable time to devote to this work, one who has a wide acquaintance. He should be able to conduct a meeting without being led up a blind alley. The same qualifications will apply to the vice-president. The secretary should, if available, be a man doing clerical work as an occupation. A neat set of records is a great help when it is necessary to formulate information for the group. A small fund is necessary to promote any organization, and a good secretary will be able to collect. The publicity man should be responsible for publishing announcements of the meetings. It is very convenient if he has artistic ability. During this first meeting the organizer will want to meet every person who comes; will want to learn of his interest and his vocation. If the leader has not the ability to meet persons and remember names, he should force himself to do so. Remembering names and faces is not a gift, it must be cultivated. During the first meeting the organizer must keep his hand on the "pulse" of the group. If anything seems especially interesting to them, then the leader must take it as a hint of possible successes in the future. If the group reacts unfavorably to anything, then similar events can well be avoided in the future.

One of the well-known, but often neglected, principles of successful functioning of any organization is that of making every member responsible for some part or function of the organization. The wisest leader works not alone but with many hands. One person calls a certain group of the other members in regard to the next meeting; another cuts a mimeograph stencil for the postal-card announcement of a future meeting (see Fig. 3); another makes blueprints which are wanted by certain members; yet another makes window posters announcing the hobby show of the year; still another prints some letterhead stationery for the organization, and so on. The competent leader finds out what each member is good for and utilizes him in a reasonable way for the good of the organization.

On Tuesday, Dec. 16TH, 7:30
BRING YOUR PROJECTS
PRACTICAL DEMONSTRATIONS
Use of the shaper, how to sharpen wood turning tools, and the Japanese "sugi" finish for cypress the enduring wood. Did you ever see a "Wobble Saw" and it's use? Come to Amos Hiatt Junior High, E 15TH & Garfield.

Fig. 3. Another announcement

The problem of arranging programs is not an easy one, or one that can be turned over to an irresponsible person. At one of the first few meetings a sheet on which are typewritten a few pertinent questions can be given to each member. From this sheet one should be able to get the person's name, address, phone number, hobby, occupation, his preference of time of meeting, how often he wants to meet, what knowl-

edge or skill he wants to get, whether or not any social meetings are wanted, whether or not an exhibit of projects is wanted at the close of the year, and so on. From the answers to these questions, the secretary or other responsible person can make up a directory. This should be mimeographed or blueprinted and copies made available to all the members. This directory will do much to encourage the members to visit one another or to call others by phone in regard to various home-workshop problems which arise.

Also the sheet of answered questions will give the leader a chance to summarize the interests of the group and formulate programs which will be of greater common interest. Adult members of such an organization come for very definite purposes, and they will continue to come so long as they are getting what they want.

A part of nearly every program can be given to the display of problems made by members since the previous meeting. The problems need not be completed. There is an inherent and everlasting interest in how things are made. A cobbler in a store window; a glass cutter in a factory; a mason laying up a chimney; a wood turner; a carver of soap, ivory, wood, or marble, and myriads of other craftsmen all attract the eye of fellow travelers in the journey through life.

One evening each year may well be given to visiting night. In groups of four or five, the home-workshop members will care to visit the better shops of some half dozen of the members. Since the shops are usually small, it is better that a schedule of visits be arranged so that each party of four or five visits each of the shops not more than a half hour each. Many ideas will thus be gained as to arrangement of the workshop, storage of tools and supplies, lighting, and the nature of the production processes employed by the particular home-workshop member.

An occasional program may be of interest which is made up of a talk or an exhibit brought in by a hobbyist from some neighboring city. There are a great many persons in each state who are becoming noted for work done during their leisure time. There are model boat builders, coin collectors, taxidermists, lapidarists, gun collectors, photographers, dendrologists, collectors of historical tools and machines, and so on. Their hobby is legion; their story and philosophy are usually most interesting.

The industrial-arts teacher, because of his training and experience, is admirably fitted to be of service to a home-workshop group. Some of the members of a home-workshop group will want to know where to buy materials and supplies. Their requirements may vary greatly. Various kinds of wood, various kinds of metal, fastenings, tools, power machines, fittings, wood finishes, chemicals, books, drawings, belts, pulleys, motors, archery supplies, and so on, will be wanted. The average industrial-arts teacher already knows where most of these can be secured and can render valuable assistance. In case that such things as suitable plans and drawings are not available, the teacher must come to the rescue and provide what is wanted. Nearly every school now has mimeograph facilities, and the teacher may be able to get permission to use such in producing material for the home-workshop group.

Various demonstrations will be wanted by the group: how to sharpen edge tools, how to apply finishes, how to solder, how to splice ropes, how to turn wood and metal, how to spin metal, how to make a Babbitt bearing, how to read blueprints, and so on. Again, the industrial-arts teacher is admirably fitted to be of assistance because of his education. To be certain, it is well whenever possible to get some member of the community or some member of the group to give the demonstration, if a competent person can be found. The teacher must be careful not to perform duties unless he is wanted, and then he must do the job well and be modest rather than conceited over his accomplishments.

Yet again, the home-workshop member will want advice on the location, arrangement, and lighting of his shop. Most home workshops just grow, "like Topsy." The industrial-arts teacher, by putting his mind to the problem, can suggest changes which will make the workshop more convenient and attractive.

Many schemes of using cigar boxes, milk bottles, tin pans, fruit jars, and so on, are common knowledge to the teacher, and the workshop member will welcome a variety of "shop-keeping" ideas from which he can choose those best suited to his needs.

One program, or possibly two, a year can well feature shop kinks, easy ways of doing seemingly difficult jobs. Each of the home-workshop members will have one or more such kinks which has served him in good stead. Such things as setting jointer knives, drilling holes true through long turned stock, using wax rather than oil on dead centers of lathes, drilling holes through glass, steaming and bending wood, folding band-saw blades, making holes in spring steel, using an ordinary circular saw as a wobble saw to cut dadoes, checking and truing levels and framing squares, and so on, will all prove of great interest to home-workshop members.

One demand made by nearly every home-workshop member will be that for plans of machines which can be made by the workshop member himself. Plans for homemade air compressors (see Fig. 4), drill presses, jointers, lathes, sanders, jig saws, table saws, and shapers will be most in demand. There have been at least 75 articles written in the various home-workshop magazines; articles which give plans and directions for making these various machines. This bibliography is too long to include in this article but can be secured gratis by writing to either of the authors. As soon as a few of the machines are made by the more creative home-workshop members, the idea will be taken up rapidly by many of the other members.

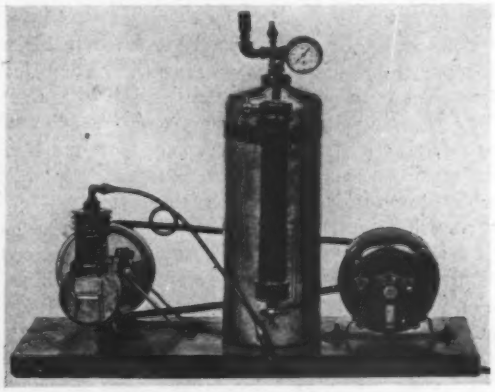

Fig. 4. A home-workshop product

One reason why some men will come to the meetings is because they afford an opportunity to exchange materials and equipment. Because of the meetings, or otherwise, their interests change from time to time. Wood and supplies which were once purchased are no longer wanted and can be sold

or exchanged to some other home workshop member. It will be well if there is provided in the place of meeting a bulletin-board area where members are encouraged to post a list of the items which they wish to get rid of or the items which are wanted.

One very fine service which the industrial-arts teacher can render is that of making a sample collection of the various home-workshop magazines, of which there are now more than a score. (A mimeographed list of these also can be secured gratis by writing to either of the authors.) From these the

Fig. 5. A home-workshop product (Made by A. Shane, Ames, Iowa)

member can select the publication best suited to his needs. Various members of the workshop organization may care to contribute their back numbers of various craft magazines for use in a circulating library for the group. Also the teacher may care to secure for distribution, copies of free literature of a combined educational and advertising nature, which are obtainable from various industrial concerns.

After one has worked a while with the home-workshop group he will discover that some persons are exceedingly clever and choicy in regard to the design of the things that they make, while others are entirely devoid of knowledge or appreciation in regard to art and design principles. One member will produce a most beautiful reproduction (see Fig. 5) of a chair, the original of which is in the Metropolitan Museum of Art, while another enthusiast will produce a heavy, bulbous, grotesque table lamp made up of 57 varieties of wood, of conglomerate zebra pattern and giving one the feeling that he is living in the dinosaurian age. Art must be wooed before it can be understood. The first thing is to somehow get the workshop members to want good art and design. However, this must be done cleverly and diplomatically, else the maker of the ludicrous will leave the organization never to come back. Well-designed pieces kept constantly in sight, good drawings, and a program, perhaps once a year, by some draftsman who can both talk and illustrate the elementary principles of industrial-arts design so that they can be understood by the amateur will be of value.

The home-workshop group, sooner or later, will want recommended lists of tools and machines. Here the organizer must be careful not to incur the enmity of local business men. However, if the hardware men, or others, are approached first, and all parties have an opportunity to make recommendations and to supply the tools which are finally recommended to the home-workshop group, there will be no ill feeling.

While fine programs will do much to make persons want to come to the meetings, yet the officers of such an organization must not forget that the Creator blessed most human beings with a mighty good forgetter. Attendance will be increased if the meetings are held regularly, possibly every other Wednesday evening, or the first Friday and the last Monday in each month, or some other set schedule, so that every member can mark his calendar clear through for the season. Also each member should receive a postal card (see Fig. 3) not over three days before the meeting. Phone calls, too, on the day of the meeting will increase attendance. Those who do not have transportation will often come if it is arranged so that other members in the vicinity call for them.

The place of meeting is an important item to consider in organizing the home-workshop group. Usually the group will be from all occupations and all parts of the city or town. Convenience of location of the meeting place will do much to keep up regular attendance. The Y. M. C. A. in some cities is able to furnish a room and facilities for such meetings. In case the permission of the school board can be secured, the average industrial-arts laboratory makes an ideal meeting place; especially is this true if there are available a demonstration area and enough seats for the group.

The time of year when the home-workshop group is organized is an important point to consider. Late spring is not a good time because gardens keep most families busy at that time. Summer, likewise, is a poor time for all concerned. Greatest interest will be found to exist if the home workshop

Fig. 6. Home-workshop members of Creston, Iowa, and industrial-arts teachers of southwest Iowa. (Chris. N. Scott, Organizer)

is organized some time in November and if the meetings terminate in early spring.

An occasional social meeting (see Fig. 6), perhaps not more than two a year, may be of value. Whether or not such meetings will be wanted will depend upon the variety of occupations represented. If there is great disparity in social status, education, and background of the group, then the social affairs will not likely be a success. On the other hand, if the home-workshop group has a common bond of friendship, the social meetings will be a success and can be arranged more often.

One of the most valuable persons to contact in an effort to having him join the home-workshop group is some member of the newspaper fraternity. Frequent articles in the paper in regard to the programs, purposes of the group, exhibits and accomplishments will be of popular interest. These will do much to build up membership in the future and to create an active interest in creative activity.

Sooner or later the question will come up in regard to the desirability of affiliation with some state or national organization. "In union there is strength"; however, a group should be very certain that they are securing additional service and benefits in proportion to the money expended.

No organization can render service long without a finance system of some sort. Stamps and postal cards are needed; mimeograph stencils and paper must be paid for; blueprint paper, stationery, and so on, all cost money. This does not in the least mean that the officers should spend money thoughtlessly. Fees are more easily collected when the members realize that they are getting their money's worth. Just how the money should be collected from the members can be left to them. Some will want to pass the hat whenever funds are low; some will want to assess a 5-cent or 10-cent fee for each attendance; some will want a single fee for the whole season. All money spent and all taken in should be recorded. Receipts should be secured for all expenditures. At the end of the season, a statement should be posted setting forth all items of income and outgo.

The home-workshop season will not be complete without an exhibit or hobby show (see Fig. 7). This should be held in some public place. If in a large city, one can usually make contact with the publicity manager of a large department store and can arrange for a room or suitable space to house the exhibit. Chamber of commerce and similar organizations have contact men who can make valuable suggestions. Notices in the paper will bring many responses from hobbyists in the city, and even those from the state will feel slighted if they are not given an opportunity to show their wares. The amount of material that will come in is astonishing. It is wise to place a limit of not over three pieces for any one person.

The home-workshop exhibit is most difficult to arrange artistically. There is such a variety of articles that if one is not careful the exhibit will have a hodgepodge appearance. The items of wood turning should be arranged together; similarly for inlay work, wood carving, reproduced period furniture, metalwork, and so on. Hooked rugs, tapestry, or other items suitable for wall hangings (it is surprising how many men take up hobbies ordinarily thought of as feminine) can be used as a background. The exhibit should, if possible, be arranged in units so that each has a more artistic appearance and so that the units will appeal to press photographers as possible pictures for the newspapers.

"Place cards" should be neatly lettered and set on or near each piece. The name and occupation of the exhibitor should

Fig. 7. A hobby show

appear on the card. Needless to say, the show should be limited to hobbyists and should not be a display of professional work. An occasional person will be found who will insist on using the exhibit of his pieces as an opportunity for business advertising. This should be forestalled by announcement that no business or professional advertising will be permitted.

If the process by which the hobbyist has done his work is not commonly known, interest will be added to the exhibit if a typewritten card explains the process briefly. The etched copper plate should appear along with the print; the kind and source of an unusual or historic piece of wood should be given; the period and source of plans for a reproduced chair will be of interest; the cost of the raw materials or the number of hours involved in making the piece, and so forth, will all be of added interest to onlookers.

Whether or not prizes are to be given is a question. When one person gets a first prize everyone else has a tendency to feel more or less dissatisfied. Hobby activity of a creative nature is very largely its own reward.

Care should be taken that exhibit pieces be not lost or damaged. Ropes should be used to keep persons from handling pieces. Very valuable items should be placed in glass cases or otherwise made safe.

A neatly framed list of the members and officers of the home-workshop organization in a central location will be of interest to many visiting the exhibit and will tend to create increased membership in future similar organizations. A tentative announcement of possible meetings for the following fall and handy blanks on which any new interested member can leave his name and address, together with a box or receptacle for holding the same, will also make for future growth of membership.

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Printing Education in America—II

Chester A. Lyle

Canton, Ohio

This is the second part of a survey of the growth of printing education in America under public, private, commercial, labor, and industrial auspices.

(Continued from the August issue)

Printing Education in the Universities

There are a number of universities offering printing education. One of the most outstanding courses given is that offered by the Division of Graphic Arts of New York University, New York City.

The aim of this Division of Graphic Arts is to develop taste and a desire for printed products of merit, and also to give the student an understanding of the many applications of art principles to a variety of printing techniques. All the members of the faculty are practical designers and executives who teach from the textbook of everyday experience. The knowledge imparted by them is fresh and representative of the best professional opinion, not only of New York but of Europe as well.

The courses cover a wide range; they appeal to the practicing designer, the plan and layout man, the printing technician, the book collector, the publishers' assistant, and many others. Teachers of printing and of art appreciation and librarians find valuable aid in their work. Even the more technical courses contain much of artistic and aesthetic value.

The Division of Graphic Arts is not a new experiment. It is now entering upon its ninth year of work and the sixth year of a comprehensive program. It was started in 1926, with the co-operation of the American Institute of Graphic Arts, and a permanent advisory committee representative of the profession and industry assures the practicability of the program. It is interesting to note that next year there is a plan on hand to enlarge the scope of the work by establishing a workshop with facilities for etching, dry-point, mezzotint, aquatint, and lithography, thus reaching into the field of fine arts.

Columbia University printing education is twofold: (1) course instruction; (2) the maintenance of a graphic-arts reference library. The courses are operating under the School of Library Service, which department of the University is charged with the responsibility of giving instruction in the various phases of book production. A number of the courses it offers are, therefore, designed not only for professional librarians but also for persons interested in the printing industries and the entire field of the graphic arts. These courses form part of the curriculum for students of library science. Book production has been given an extensive place.

Practically all of these courses are regularly attended by practical printers, publishers, manufacturing men, magazine editors, etc. From the outset, most of the courses were meant for people both in and outside the University. In practice, the mixture of students from the printing industry and library science is very stimulating to both groups. Subjects offered in this course include ancient writing, medieval illumination, history of book production, modern book production, book

illustration, bookbinding, modern typography. In connection with the Graphic-Arts Reference Library it is what is believed to be the most extensive library in America on the application of photography to the graphic arts.

One of the many outstanding contributions of the School of Library Service and the Rare Book Department was the exhibiting and publishing of the booklet "Fifty Books About Bookmaking," which named outstanding publications of the various branches of book art, for the Conference on Printing Education held at Columbia University in June, 1933. It is interesting to note that the Arts et Metiers Graphiques was listed in the international group. Dr. Hellmut Lehmann-Haupt, Curator of the Rare Book Department, was responsible for this valuable contribution to printing education.

Vocational Printing Schools

The largest industrial school of the nation is The New York School of Printing, New York City, organized in March, 1925, under the direction of the board of education, which appointed Mr. J. Henry Holloway, principal, who has served continuously. This day school is made up of five separate departments in which are enrolled preapprentices, apprentices, journeymen, students, in compulsory, part-time, and industrial high school, with a total enrollment of 906. In addition to the principal and his clerical force, there are 26 instructors.

There are 455 students enrolled in the evening sessions, all of whom must be employed in the printing trade. Fifteen instructors with the principal and his clerical force comprise this faculty.

School sessions are held in two centers. Leases have been signed for new quarters in the Print Crafts Building for practically all of the shopwork, on one large floor. The floor has a carrying capacity of 250 pounds to the square foot, which is necessary for the large presses. The area of the new space for the shops is approximately 23,500 square feet. All academic work, except for apprentices, is given in a school building which the New York school completely occupies. The two parts of the work are located so near to each other that at the noon hour the students transfer from one building to the other. As it should be, the school is located in the principal printing center of the city. The curriculum offered is that contained in the usual course of instruction. They are intensified to a higher degree because of the extensive equipment which is valued at over $90,000, some of which has been donated or loaned by manufacturers. Every division of the school has an advisory board. Situated in New York, the school has the advantage of securing for its advisory boards outstanding leaders, most of whom are known nationally, and some of whom have acquired international reputation. The boards are made up of equal representation of organized labor and employing printers, both of which are under mutual contract with each other, and with the board of education for carrying on their service in the interest of apprentice instruction in the school.

The Printing Teachers' Guild, one of the largest organizations of its kind in the country, originated in this school. It includes all printing instructors in all types of schools in New York.

The Technical Trade School is located at Pressmen's Home, Tennessee, and is operated by the International Printing Pressmen and Assistants' Union of North America. The work of this school is unique in that it is the hub around which the educational work of the organization revolves. This work includes an apprenticeship system, engineering and service work, affecting the entire industry and the conduct of practical demonstration courses in all processes of printing given to experienced men who come to the school. The school, the only one of its kind in the country, specializes in training by giving highly intensified courses in letterpress, offset work, and pressroom management. The equipment of the school inventories between $300,000 and $400,000, and yet only a relatively few men (about 20) can be accommodated at one time, and that only when all of the facilities of the school are turned over to this training. There is no set time for the completion of a course. The work is individual but the courses are standardized. This is so because each individual who comes to the school constitutes an individual problem, and must be handled a little differently from the others who attend.

Many employers send their best pressmen, or their pressroom executives, to the school for special training. Many are sent here for the purpose of mastering offset printing, and the courses for these men can be more or less standardized.

Students are accepted the year around, not in classes, but individually, according to when there is an opening available, in the department where he wishes to specialize.

As a result of apprentice training, there is in operation an apprentice system covering the United States and Canada, which is very effective in its way. It is predicated upon the method of supplementing the daily work of the apprentice in the shop by a properly conducted home-study course. It is compulsory that every apprentice pressman take this course before he becomes a full-fledged journeyman. The International Printing Pressmen and Assistants' Union supplies this course free of charge to properly registered apprentices and all the work in connection therewith goes through this school. All of it, however, is not done by the school staff. In every city there is an educational committee functioning through local unions. It is the duty of this board to conduct quarterly examinations of the registered apprentices and to report to the school director each quarter at least. Generally these local boards are made up of foremen or outstanding journeymen. In some cases, there are shop examining boards, headed by the foremen. Such an arrangement makes possible a contact between the apprentice and the foreman which can be made mutually advantageous.

The Technical Trade School also conducts a course in both commercial and newspaper presswork which can be subscribed to by journeymen. They are home-study courses.

The service work spoken of previously includes advice on patents, new machines and devices, and a free service to anyone who desires an analysis made of any printing trouble encountered. Hundreds of inquiries are received each month and some of these are published. All of those making inquiries or seeking aid for their trouble are written direct.

Tied up with the educational system is the monthly publication, *The American Pressman,* which is the official organ of the International Printing Pressmen and Assistants' Union. This is primarily a technical journal devoted to pressmen and pressroom operation, with a circulation of approximately thirty-five thousand.

One outstanding feature of the service work is that of the Newspaper Engineering Department, which helps the newspaper industry, free of charge, to solve production and quality printing problems which may arise. Many of the questions submitted are handled through correspondence, as the engineering department receives daily some 500 newspapers. In addition to this, the school has practically taken charge of between 400 and 500 plants, in which is given an engineering service for the purpose of overcoming any troubles en-

countered in the mechanical departments, or in co-ordinating the various departments for the benefit of all concerned. In the conduct of this work there has been an unprecedented co-operation from the foremen of the various departments, as well as from the men. The result has created not only a better feeling between departmental heads and management, but also an improved product.

This is a vast educational system, having many divisions and conducted for the purpose of contributing to the advancement of the individual as well as of the industry as a whole.

The State of California has long been noted for its successful educational systems. Although the Frank Wiggins Trade School was only founded by the Los Angeles, Calif., board of education in May, 1925, its progress has brought it to the front ranks of industrial educational opportunities. Eighty teachers, each a skilled craftsman in his subject, are on the faculty. As a public school, the big plant is supported by local, state, and federal funds and is under the Smith-Hughes act promoting vocational training. No tuition is charged.

The present building, eleven stories in height, has seven acres of floor space. Sixty-five trades, including printing, are taught to 2,850 students. The day school is interested primarily in apprentice training. The evening school enables craftsmen to further their knowledge, as, for instance, hand compositors, who desire to study linotype or monotype.

The training in the day school of the printing department has as its objective the advanced apprentice. Included are courses in hand composition, linotype keyboard operating and mechanism, the monotype keyboard and caster operation, presswork, and bindery work.

The entire printing department has the atmosphere of a large industrial printshop. Only jobs having instructional value are accepted from the board of education for production, no outside competitive printing is accepted. Every possible effort is made to exhaust the teaching possibilities before any delivery is made. All instruction is individual.

Equipment of the printing department inventories $80,000 and is quite modern in every respect. In addition to a well-supplied hand-composition department, there are twelve linotypes, three monotype keyboards, and three casters. The pressroom has platens, verticals, a horizontal, a cylinder press, and a Kelly B. Sufficient equipment to teach pamphlet binding is in the bindery department of the school.

The instructors were selected from the Los Angeles graphic-arts industrial field. All are outstanding craftsmen in their respective divisions, each having at least fifteen years' practical experience. The head of the department, Mr. Atwell L. Jobe, has been a resident of Los Angeles for twenty years, having worked for a number of trade composition houses. Previous to joining the staff of the trade school, he was foreman for nine years at the Western Linotype Company in charge of productions. He also is a past president of the Los Angeles Club of Printing House Craftsmen, and has served as chairman of the apprentice committee for the past two years.

The work being done by the Frank Wiggins Trade School is invaluable to industry, to the community, and to the students. The training program of the department was developed to meet the needs of the local graphic-arts field, and committees from many of these shops served in an advisory capacity in organizing the content of the program.

The Ottmar School of Printing, Baltimore, Md., named after Ottmar Mergenthaler, the inventor of the linotype, was established in 1923, by the department of public education in that city, with the co-operation of the Typothetae. The school is housed in its own building, and has a fine, modern plant with facilities for instruction in hand composition, linotype, monotype, and presswork. Both day and evening courses are offered. The day school is three years in length of 45 weeks each year. Five teachers are employed in the day school and seven in the evening school. Because of the practical nature of the instruction, and the thorough training given the student, the school is nationally recognized as one of the leaders in the field.

While not having the wonderful layout of the New York School of Printing, or the London School in England, the Milwaukee Vocational School, Milwaukee, Wis., is recognized not only for the very excellent work it produces, but also for the success it maintains in preparing young men and women for the industry.

Launched in 1912, when less than twenty schools in the United States offered instruction for printers' apprentices, the printing department of the Milwaukee Vocational School may be said to be one of the pioneers in this field.

The modest equipment of 1912, approximating $800 in cost — and but few contemporaries did then boast of much more — has been augmented by additions and replacements, until the present establishment compares favorably with the foremost schools of the country. New type faces, both of domestic and foreign manufacture, and new machines are added from time to time to keep pace with the advance made in industry.

Seven full-time day instructors and nine evening-school instructors are required to teach the 400 or more apprentices and journeymen, who are annually enrolled in the department for trade-preparatory or trade-extension work.

To the insight, foresight, and guidance of Dr. R. L. Cooley, director of the Milwaukee Vocational School since its founding, perhaps more than to any one man, the school owes any claims for success to which it may be entitled. At the very inception of his work, he sought to break away from the fixed curriculum of the traditional school; to shorten the path to a given goal by the simple method of dispensing with superfluities and to make professional and technical courses available to those who needed them, and to employ and instruct people at a time best suited to their needs, so that they may continue the learning process without any interruption to the earning process.

The thirteen courses offered in printing and the allied trades include: elementary and advanced typesetting; linotype and monotype machine composition; imposition; platen, job cylinder, and cylinder presswork; color theory; ink mixing; art appreciation and advertising design; commercial art; proofreading and editorial writing; and bindery machinery adjustment.

An interesting department is a room adjacent to the pressroom, which is called the "precision room." This room is supplied with Hacker and other precision gauges, routing machines, overlay papers graded by thousandths from .001 to .01, markout and overlay tables, precision register tables, and other equipment necessary to bring plates and forms into correct adjustment.

A course in color harmony and ink mixing is taught cooperatively by two instructors — one a practical color pressman, for many years foreman of the pressroom of a greeting-card plant; the other an ink chemist, actively engaged in the trade. When this course was first offered three years ago, it was thought by its sponsors to be the only one of its kind in America, if not in the world. However, disillusionment soon followed. Among the first students to enroll was a journeyman from Switzerland who had had a similar course there.

The evening proofreading classes are taught by the head

proofreader of one of Milwaukee's large periodical and book publishing houses; editorial writing by an assistant editor of one of the large daily newspapers. Printers, writers, advertising managers, secretarial workers, and teachers find these courses helpful.

Statistics concerning the school follow: floor space, 11 acres; height of building, seven floors; number of classrooms, shops, and laboratories, 210; separate courses offered in the day school, 99; in the evening school, 98; total annual enrollment, 32,400.

Detroit, Michigan, public schools are thoroughly equipped for the early training of boys who propose to enter the printing industry. Intermediate schools give prevocational, or exploratory courses in printing, to find out if the boy is adapted to the work. After his work in the intermediate printshop, the student enters the technical work at Cass Technical High School. The printing equipment here is especially complete in each department, thoroughly modern, and well balanced for basic training. The department is cared for in five rooms, two composing rooms, a pressroom, a bindery and stock room, and a recitation room. Five experienced instructors teach the shop and related work, with Mr. Ralph W. Polk, supervisor of printing instruction for the city, as head of the department.

One of the foremost high schools of the middle west is McKinley High School, located at Canton, Ohio. Statistics for 1933–34 show: Cost of site, $89,835; cost of building, $2,345,461.26; floor space, acres 6.21; day-school enrollment, 4,055; night-school enrollment, 1,051; lot, 246 by 500; rooms, 120; classes, day, 612; teachers, day, 125; night, 42.

Not only is McKinley High School recognized for its successful academic curriculum, but it has a national reputation for its printing course. This course was established in 1912, with an enrollment of 40 students. Today, the department has a daily enrollment of 120 students, and although following the general procedure of instruction in printing, has evolved many new ideas in its methods.

Perhaps the most outstanding feature is the development of a course in art in printing for training printing students. Finding that there were no textbooks that covered, nor schools that offered such a course, though some schools gave art as a correlating subject — in the majority of cases, however, it was more art appreciation than design, which did not fit the needs — experiments over a period of three years were carried on to develop what was needed.

A plan was mapped out which consisted principally of having students do lettering, letter arrangements, draw borders, etc., also make their own mixing charts. Particular attention was paid in the art department to lessons and lectures on emphasis, contrast, balance, proportion, shape harmony, tone harmony, spacing, and to current practices in printing, and on the elements in design based upon the laws of beauty and arrangement. Following the completion of his layout made in the art department, the student is allowed to set his work in type, put it on the press, and run it off in as many colors as his layout requires. A "radical venture," as someone has called it, allows the art teachers to bring their classes at any period into the printing department, and supervise their students' work. The teachers are allowed the freedom of the shop, handle type, border, help mix colors, and give instruction as they see fit. These students are printing students, familiar with the shop and its equipment, and in no way interfere with the regular printing classes.

Summing up the advantages of this method one finds: (1) that printing must be taught from an art and appreciative standpoint; (2) a sympathetic art teacher, who has knowledge of art principles as applied to the printed page, can give courses directly planned for students in printing which makes an ideal situation; (3) art in printing in the school printshop has received less effective attention than it deserves. The day is near at hand when textbooks in art in printing for printing courses will be available for instruction purposes; (4) making collections of specimens of fine printing and of specimen sheets of type faces, making them accessible to the student, develops printing appreciation; (5) any art course for printing students should give the information necessary to build an appreciation for the art history and art basis of all modern type ornaments, borders, and type faces. This heritage is still the source of inspiration for much fine typography and beautiful type faces. Such knowledge is most valuable when the student does layout work, or prepares designs suitable to definite advertising or other typographic problems.

The printing instruction includes the use of the latest textbooks, the courses offered by the International Typographical Union, and those prepared by the department of education of the United Typothetae of America. In this way McKinley High School is closely allied with trade organization and the general trend of printing education in America. Mr. Chester A. Lyle is the department head.

(To be concluded)

Drafting-Room Practice

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A helpful summary of the American standard drawing- and drafting-room practices which were approved by the American Standards Association, May, 1935.

Mechanical Drawing has often been described as "the universal language of industry"; "the graphic language of industry"; "the alphabet of the skilled mechanic and engineer"; etc. These terms may be appropriate and are rather high-sounding but are only partially true; as wide variations in practice have been in vogue and continue to exist. Despite the fact that many major industrial concerns have improved the situation by standardizing their drawings, nevertheless, the variations in existence among industries have been confusing to draftsmen and designers alike. It has caused much annoyance and many inconveniences. The instructors of mechanical drawing in our schools and colleges, likewise, have been disconcerted. They desire to be progressive by keeping abreast of the best and most modern commercial practices. They are confused, however, as to which is the best practice. This situation has resulted, during the past decade, in a growing demand on the part of mechanical-drawing instructors and others

for the formulation of a national standard of drafting-room codes and practices.

Studies have been made by various individuals and their findings published from time to time. One of the first attempts to determine drafting-room practices was made by Calvin C. Bishop, of the Buffalo, New York, Technical High School, in 1922, through the dissemination of a questionnaire. A year later (1923–24) a similar study was made by Professor Frederick W. Ming, of the Polytechnic Institute of Brooklyn, New York. In the May, 1924, issue of *Mechanical Engineering* there appeared a comprehensive study of drawing-room practices by Mr. H. D. Campbell of the J. Sterling Morton High School of Cicero, Ill., and Professor H. B. Langille of the University of California. Another drafting-practice survey made by H. D. Campbell, appeared in the May, 1929, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, and "A Survey of Drafting-Room Practices," a study made by F. R. Kepler, Chairman of the Committee on Mechanical Drawing of the Michigan Industrial Education Society, was published in the March, 1936, issue of this magazine. In addition to these studies, much progress has been made by the writers and publishers of textbooks in the field of Mechanical Drawing, Engineering Drawing, Machine Design, etc. One of the outstanding leaders in this respect, for more than a score of years, is Professor Thomas E. French, of the Ohio State University.

The long-felt need for a standard code of drafting-room practice culminated in the appointment of a committee, in 1925, to study this problem thoroughly. The committee consisted of members of the American Standards Association, the American Society of Mechanical Engineers, and the Society for the Promotion of Engineering Education. This committee, in turn, appointed various subcommittees and enlisted the aid of others interested in the problem. The result was the publication in May, 1935, of a 24-page pamphlet entitled *American Standard — Drawings and Drafting Room Practice.*[1]

This pamphlet contains materials dealing with the following subjects: (1) Arrangement of Views, (2) Lines and Line Work, (3) Sectional Views, (4) Dimensioning, (5) Screw-Thread Representation for Bolts and Threaded Parts, (6) Trimmed Sizes of Drawing Paper and Cloth, and (7) Lettering.

The following is a brief summarization of the committee's recommendations under each of the various major topical headings:

1. Arrangement of Views

a) For drawings in orthographic projection the third-angle system or the American Standard is to be used.

b) The six principal and possible views of an object, to be drawn mechanically, are: (1) front, (2) top, (3) right side, (4) left side, (5) rear, and (6) bottom.

c) In third-angle projection the top view is placed directly above the front view, the right-side view to the right of and facing the front view, and, in similar relation the left-side view is placed to the left of the front view.

d) When the space is limited the side view may be placed opposite the top view.

e) When it is advantageous to draw both side views, it is unnecessary to draw the complete views of the entire object, if together, they describe the shape of the object.

f) Bottom views should not be shown in steel-plate and structural drawings. Instead, a sectional view, looking down, with the cutting plane a little above the bottom, should be used.

g) Hidden lines should be indicated by short dashes about ⅛ in. in length and spaced 1/16 in. apart. These dashes should be lighter in weight than the object line or outline of the object to be drawn; in order to give the proper contrast between parts of the object. Invisible lines should always begin with a dash, connecting the line from which it starts, except when the dash forms a continuation of a full line. Dashes should touch at corners. Circle arcs should start with dashes at tangent points.

2. Lines and Line Work

a) All lines should be clean and black to permit reproduction of drawings.

b) Hidden lines should be reduced to a minimum; sections being preferable in many cases.

c) The width of lines should be determined by the size and style of the drawing.

d) Three weights of lines, heavy, medium, and light, are recommended for inked drawings. For rough sketches and penciled drawings from which blueprints are to be made, two weights, medium and light, may be used.

e) Lines are employed as follows:

1. *Outline of Parts — Heavy line.* The outline should be of sufficient weight to give contrast and stand out from the other lines.

2. *Cutting Plane — Heavy line.* A broken line composed of one long dash and two short dashes alternately spaced.

3. *Hidden Lines — Medium line.* Short dashes about ⅛ in. in length with a space of 1/16 in. between dashes.

4. *Adjacent Parts and Alternate Positions — Medium line.* A broken line composed of dashes about ¼ in. in length with a 1/16 in. space between dashes.

5. *Ditto Line — Medium line.* Indicates repeated detail and is composed of series of two ⅛ in. dashes with 1/16 in. space between the two dashes and ⅛ in. space between each series of two dashes each.

6. *Section Lines — Light lines.* To be spaced evenly to give a shaded effect.

7. *Center Lines — Light lines.* A broken line composed of long and short dashes alternately spaced.

8. *Dimension and Extension Lines — Light lines.* Unbroken lines except at dimensions.

9. *Break Lines* —

Heavy line — Freehand line for short breaks.

Light line — A horizontal ruled line and freehand zigzag for long breaks.

f) Extension and dimension lines are the same weight. Extension lines should not touch the outline of the figure.

g) Break lines may be used on both detail and assembly drawings.

h) In addition, approximately thirty symbols representing metals, alloys, building and other constructional materials are represented and recommended.

3. Sectional Views

a) Sectional views or "sections" should be used when the exterior or outside views fail to show the interior shape and construction clearly.

b) A sectional view should represent the front view cut or broken away.

c) The exposed surface of the material is indicated by "section lining" or "crosshatching" with uniformly spaced lines.

d) "Section lines" should be light lines drawn parallel to each other at an angle of 45 deg. with the border line of the drawing and spaced uniformly apart from 1/32 to ⅛ in.

e) When two adjacent parts are to

[1]This pamphlet may be secured for 50 cents, single copies, from The American Society of Mechanical Engineers, 29 West 39th Street, New York City.

be sectioned the section lines should be drawn in opposite directions.

f) When a third part of an object, adjacent to two other parts, is represented, section lines should be drawn at 30 deg. or 60 deg.

g) If an object is cut in more than one place the sectioning of any part should be the same in direction and spacing.

h) Hidden lines and details beyond the cutting plane should be omitted unless they are required for purposes of clarity.

i) Symbolic section lining indicating various materials of construction is used to call special attention to certain parts or for purposes of identification. If desired, however, equally spaced full light lines in one direction may be used with an opening for a symbol or name of material to be indicated.

j) Cutting planes passed through objects to represent sections are lettered as AA, BB, etc., and are indicated by a heavy line consisting of one long and two short dashes alternately spaced. At the extremities of the cutting plane are short lines (¼ to ⅜ in. long) at right angles with arrowheads at the ends to show the direction in which the section is to be viewed.

k) On simple symmetrical objects the heavy line (cutting plane) letters and arrows may be omitted.

l) It is unnecessary for a cutting plane to be a continuous line. It may be bent or offset if the construction can be shown more advantageously.

m) When a cutting plane is drawn entirely across an object a full section is shown. A symmetrical object may be drawn in "half section," showing one half, that is, up to the intersection of the vertical and horizontal center lines in section and the other half in full view.

n) "Broken-out Sections" should be used where only a portion of a section is needed.

o) "Phantom Sections" or dotted sections which are exterior views with the interior construction shown by dotted section lining are recommended for occasional use as they save drawing an extra view.

p) Sections which are too thin for line sectioning may be shown solid, such as structural shapes, sheet metal, packing, gaskets, etc. Where two or more thicknesses are to be shown a small space should be left between them.

q) Bolts, keys, nuts, pins, rivets, rods, shafts, etc., whose axes lie in the cutting plane, are not shown in section.

r) When the true projection of an object may be confusing, by having a part foreshortened, such as ribs or arms on a three- or five-spoked wheel, the part or parts not in true projection should be rotated until parallel to the plane of projection. This procedure is for purposes of clarity.

4. Dimensioning

General Rules

a) Drawings are dimensioned to eliminate the necessity of scaling the views shown.

b) Dimensions placed on drawings should be the exact sizes used in actual construction. They should make computation unnecessary for the one using the drawing.

c) Sufficient dimensions should be placed on a drawing to permit the producer of the part shown to proceed intelligently. Dimensions should not be duplicated on the same or different views, except where it will add to clarity.

d) Dimensions of parts, which can be measured or reproduced with sufficient accuracy by using an ordinary scale, should be written in units and common fractions. Parts requiring greater accuracy should be dimensioned in decimal fractions.

e) Wire, tubing walls, sheet metal, standard structural sections, etc., should be described by commercial designation followed by dimensions in decimals.

f) Dimensions up to and including 72 inches should preferably be expressed in inches and those of greater length in feet and inches.

g) Dimensions calling for accurate matching with small tolerance dimensions should be given in inches and decimal fractions.

h) In structural drawing all dimensions of 12 inches and over should be expressed in feet and inches.

i) In automotive, locomotive, sheet metal and some other practices all dimensions are specified in inches.

j) The symbol (″) is used to indicate inches; common and decimal fractions of an inch.

k) When all dimensions are given in inches the symbol is preferably omitted. A note may be given stating that all dimensions are given in inches.

l) The symbol (′) is used to indicate feet and fractions of a foot. Dimensions in feet and inches should be hyphenated, thus: 4′–3″; 4′–0½″; 4′–0″.

Dimension Lines, Extension Lines, and Leaders

m) Dimension lines should be fine, full lines, broken where dimension is inserted, so as to contrast with the heavier outline of the drawing, and should be placed outside the figure whenever possible.

n) Dimension lines should be terminated by carefully made arrowheads whose lengths are approximately three times the spread.

o) Extension lines indicate the distance measured when the dimension is placed outside the figure. They are made as light full lines starting 1/32 to 1/16 in. away from the outline and extending about ⅛ in. beyond the dimension line.

p) Leaders should be made up of light straight lines terminated by arrowheads. They should not be curved or made freehand.

q) A center line should never be used as a dimension line.

Dimension Figures

r) A dimension line must not pass through a dimension figure.

s) When fractional dimensions of less than an inch are given, the numerator should be placed above the dimension line and the denominator below.

t) All dimension lines and their corresponding numbers should be placed so that they may be read from the bottom or right-hand edges of the drawing.

u) When there are several parallel dimension lines the figure should be staggered to avoid confusion.

v) Dimensions should be given from a base line, a center line or a finished surface that can be readily established.

w) Over-all dimensions should be placed outside the intermediate dimensions.

x) For dimensioning in limited space the arrowheads should be reversed.

y) In dimensioning angles an arc should be drawn and the dimensions placed so as to read from the horizontal position.

Dimensioning Circles

z) A dimension indicating the diameter of a circle should be followed by the abbreviation "D"; except when it is obvious from the drawing that the dimension is a diameter. The dimension of a radius should always be followed by the abbreviation "R." The center should be indicated by a cross or circle, and the dimension line have one arrowhead.

Dimensioning Holes

a′) Holes which are to be drilled, reamed, punched, swaged, cored, etc., should have the diameter, given preferably on a leader, followed by the word indicating the operation and the

number of holes to be made.

b') Holes which are to be machined after coring or casting should have finish marks and finished dimensions specified. For counterbored holes the diameters and depths should be given and for countersunk holes the angles and diameters should be given.

Dimensioning With Tolerances

c') Accurate dimensions which are to be established with limit gauge or micrometer should be expressed in decimals to at least three places and the drawing should give the limits between which the actual measurements must come. For external dimensions the maximum limit is placed above the line and for the internal dimensions the minimum limit is placed above the line. This method should be used for smaller parts and where gauges are extensively employed.

d') A second method, for larger parts and where few gauges are employed, is to give the calculated size to the required number of decimal places, followed by the tolerances plus and minus, with the plus above the minus.

Use of Notes and Tables

e') The legibility and appearance of drawings may often be improved by specifying dimensions representing a series of tool operations by notes instead of using figured dimensions. . . . All notes should preferably read horizontally.

f') On a drawing, if a dimension must be changed, the changed figures should be underlined or otherwise marked.

Dimensioning Fits

g') Whenever possible the tolerances and allowances for a desired fit should conform to those set up in the American Standard for Tolerances, Allowances, and Gauges for Metal Fits (ASA-B4).

Dimensioning Tapped Holes and Threaded Parts

h') These parts should be specified in general by reference in notes to the American Standard Coarse, American Standard Fine, American Standard Special Screw-Thread Series with full reference to the class of fit desired (See ASA-B1).

Curves and Angles

i') A curved line may be dimensioned either by radii or offsets. When angular dimensions are necessary a horizontal or vertical center line should be used as a base line, but not both, and points located from it. If holes are to be equally spaced, one should be located and a note added, e.g., "6 Holes Equally Spaced."

Dimensioning Tapers

j') The difference in diameter or width in one foot of length is known as the "taper per foot." At least three methods of dimensioning tapers are in general use.

1. *Standard Tapers.* Give one diameter or width, the length, and insert note on drawing designating the taper by number taken from ASA-B5.

2. *Special Tapers.* In dimensioning a taper when the slope is specified, the length and only one diameter should be given or the diameter at both ends of the taper should be given and the length omitted.

3. *Precision Work.* In certain cases where very precise measurements are necessary the taper surface, either external or internal, is specified by giving a diameter at a certain distance from a surface and the slope of the taper.

Finish Marks

k') Metal surfaces to be finished or machined have been designated for many years by the letter *f*. To meet the criticism that this symbol is inadequate and gives a poor appearance to the drawing, it is recommended that a 60 deg. V, with the bottom of the V touching the surface to be machined, be used. A code figure or letter is to be placed in the opening of the V to indicate the kind of finish required. A standardized code for use with the V is now being developed (1935) by a committee on Standardization of Classification and Designation of Surface Qualities.

5. Screw-Thread Representation for Bolts and Threaded Parts

a) Thread Symbols, Regular and Simplified

1. The regular conventionalized method of representing external and internal screw threads is recommended. In the regular screw thread, the threads are indicated by alternate long and short cross lines at right angles to the axis representing the crests and roots of the thread, the short lines are drawn heavier than the long lines, or of equal weight if preferred, spaced by the eye to look well. They need not represent the actual pitch.

2. All screw threads are considered "right hand" unless otherwise specified.

3. Ends of bolts are to be drawn flat and chamfered at 35 deg. (drawn at a 30-deg. angle) to the depth of the thread.

b) Pipe Threads

1. Pipe threads are drawn the same as bolt threads.

2. It is unnecessary to indicate pipe tapers on drawings.

3. The American Standard for Pipe Threads (ASA-B2) should be used and reference should be made on the drawing relative to diameters, form, and length of thread and taper.

c) Thread Pictures. When "thread pictures" are required, the helices are conventionalized into slanting straight lines and the contour shown as a sharp V at 60° although the standard threads are truncated at the top and filled in at the root. The American Standard for Screw Threads (ASA-B1) should be used as a reference.

d) Bolt Heads and Nuts. The American Standard for Wrench Head Bolt and Nuts and Wrench Openings (ASA B-18-2) is recommended for exact dimensions of American Standard rough, semifinished, and finished bolt heads and nuts.

6. Trimmed Sizes of Drawing Paper and Cloth

The new standard sizes recommended for trimmed sheets of drawing paper and cloth, in the United States, are as follows:

A — 8½ by 11 in., B — 11 by 17 in., C — 17 by 22 in., D — 22 by 34 in., E — 34 by 44 in.

The basis for these sizes is the 8½ by 11 in. commercial letterhead. These sizes will permit the folding of blueprints into convenient sizes for filing in standardized commercial letter files.

For countries using the metric system, the sizes of trimmed sheets are based on the ratio of the width to the length of 1 to $\sqrt{2}$ and are as follows:

AO — 841 by 1189 mm, A1 — 594 by 841 mm, A2 — 420 by 594 mm, A3 — 297 by 420 mm, A4 — 210 by 297 mm, A5 — 148 by 210 mm, A6 — 105 by 148 mm.

7. Lettering

The requirements of good lettering are: (1) legibility and (2) speed of execution. These two requirements are met in the single-stroke commercial Gothic letter used almost universally in the field of drafting.

The recommended standard for lettering is as follows:

a) Single-stroke Gothic either vertical or inclined be used on all working drawings for titles, notes, etc.

b) If inclined lettering is used the slope should be 2 in 5.

c) All letters in the title should be capitalized.

d) If vertical lettering is used for notes, bills of material, etc., all the letters should be capitalized.

e) If inclined lettering is used for notes, bills of material, etc., the letters may be all capitals or capitals and lower case.

f) The size and weight of all lettering should be such as will produce legible prints, either from pencil or inked tracings.

g) Lettering should be underscored only for purposes of emphasis.

Conclusion

The committee responsible for these standards recognizes the fact that many workers in the drafting field will be reluctant to relinquish "pet practices" and break habits of many years' standing. In the interest of adopting a uniform standard of practice, individuals are expected, however, to cast aside personal preferences. It is only through compromise and a willingness to accept the practices of the majority that an adopted practice can be termed authoritatively a standard.

Furthermore, a standard code of practice will eliminate much confusion in industry; among designers; engineers; draftsmen; and among schools and colleges, many of whose students shift and transfer frequently, but who, nevertheless should know this code when they enter industry.

The Auto as a Vitalizing Factor

John E. Quick

East Technical High School, Cleveland, Ohio

The author shows in a practical way how he used his shop subject as a vitalizing factor in the high-school curriculum. His method may be followed with equal success by shop teachers of other subjects.

Much attention is being given to the reorganization of the secondary-school curriculum by teachers and supervisors. One of the salient features of this reorganization involves the integration and vitalization of subject matter. This revision movement has been given impetus by the depression, with its social, economic, and industrial problems presenting a situation which requires not only a strict justification of all school expenditures upon a very efficient basis, but which also demands that the student be given a training that will enable him to adapt himself more fully to a new and somewhat difficult environment. Limited budgets for salaries and equipment have resulted in an increased class size, which usually leads to a more formal type of instruction. Most teachers object to the larger class size on the ground that adequate supervision of each pupil's work is practically impossible; however, present indications offer little hope of a return to the smaller class size, at least in the near future. This decrease in individual attention results in a lower educational efficiency unless counteracted by the use of subject material that is inherently more interesting to the student, or by a more efficient method of presentation, or by a combination of both. The problem of revision from the teachers' viewpoint, then, is not so much one of eliminating some of the basic principles underlying the content of the various courses of study as that of finding new content material that will convey these basic principles and at the same time have an evident and not-too-distant application to the pupils' everyday life.

Much progress has been made recently in "tying up" industrial arts and vocational courses to industry and actual life experiences by the use of related materials or information, but little has been done in this direction in the field of academic subjects, which have only begun to abandon the formal type of subject matter. This situation is not only unfortunate, but totally unnecessary.

The automobile, with its complexity of construction and its great influence on our industrial, economic, and social life, for instance, provides a rich field of material much of which is essentially academic in content, and at the same time could have an integrating influence on the entire curriculum.

The automobile has, of course, been used in a variety of ways as an instructional device; however, it has usually been thought of as suitable only to such courses of instruction as auto mechanics and auto repair. Although it is true that some schools have used it as an instructional device in some of the science courses, it is doubtful whether many have begun to appreciate the extraordinary wide range of interest and appeal it has for students of high-school age, especially for those who are learning to drive a car and are looking forward to owning one.

Aside from all this, the problem of safety instruction relative to the use of the automobile demands the immediate attention of teachers, especially those in the secondary schools. Statistics show that the most dangerous drivers are from 15 to 24 years old. The death rate for this group for the past ten years has increased by approximately 140 per cent, whereas the increase for all groups is 80 per cent.

An experiment, the purpose of which was to reveal to teachers the large amount of subject matter related to the automobile that is available for use, to focus the attention of the entire school upon one objective, and to give safety instructions, was conducted at Cleveland East Technical High School recently. The experiment was called Automobile Week. For an entire week all class time in both technical and academic courses (with a few exceptions) was devoted to the study of the automobile and such relative topics as could be correlated with the objectives of the various subjects.

To conduct an experiment of this kind in a school with an enrollment of 3,300 boys requires much preliminary survey work and careful planning of procedure. Accordingly, a committee composed of a representative from each department in the school was appointed by the principal. The committee, acting as a whole, formulated the general program and passed upon the departmental program set up by each representative. This committee began working several weeks before the date was set for Automobile Week, in order to have adequate time to secure materials and to set up a carefully prepared schedule.

Realizing that the success or failure of the experiment depended to a great

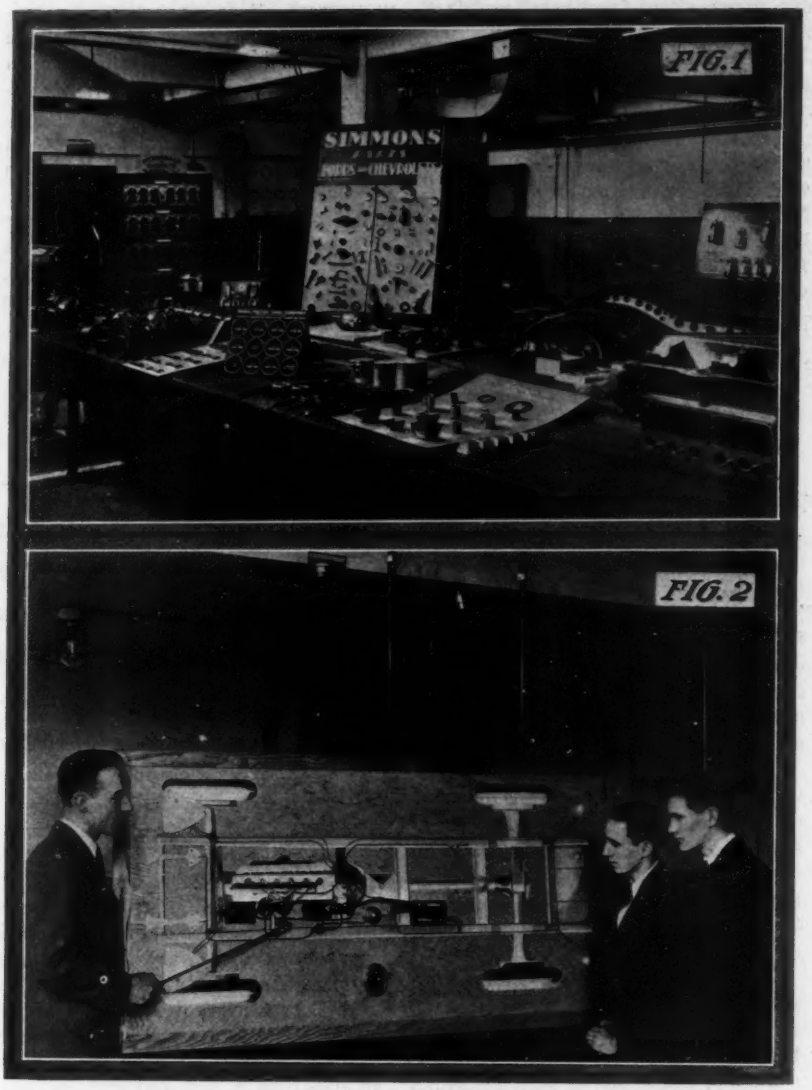


Fig. 1. A part of the educational and technical exhibit. Fig. 2. A project in automobile wiring circuits constructed by 10B elementary electricity class

extent upon the interest taken in it by the individual teachers, the committee desired, as its first step, to present the purpose of the week to the various teachers in such a manner as to enlist their co-operation. Accordingly a faculty meeting was called, during which the need for the project, its objectives, and a preliminary plan were presented. Each representative outlined the possibilities of a program for his department and presented a list of source materials which might be used as the basis of a program. During the several weeks preceding the experiment various conferences were held with teachers and department heads, for the purpose of exchanging ideas, distributing materials, and correlating the various phases of the work. In order to insure an adequate preparation of class programs, each teacher was required to submit a day-by-day schedule of class activity for the week.

An effort was also made to sell the idea of an Automobile Week to the students to develop the right attitude toward the project on their parts. This was necessary because it was felt that an abrupt departure from the regular class routine might cause the pupils to regard the Week as a holiday and so to neglect the preparation of their lessons. To forestall any such attitude, the school paper, homeroom programs, hall bulletin boards, and display cases were used to present interesting and educational information bearing on the project. The issue of the school paper appearing during Automobile Week was devoted almost exclusively to the news, facts, and statistics relative to the automobile.

The local newspapers, too, were apprised of the project and most of them carried articles that not only added to the interest of the student body but also brought the attention to many commercial organizations and agencies to the school and the project. Many of the automobile dealers, parts jobbers and manufacturers, oil companies, insurance and finance companies, the Safety Council, etc., either sent a personal representative, called by phone, or communicated by letter, expressing their desire to be of assistance through the loan of display and demonstrational material, literature, films, speakers, and the like.

The committee found information relative to the automobile comparatively easy to obtain, as the competition between the various manufacturers and distributors makes them very desirous of bringing their respective products to the attention of as many persons as possible.

Some of the more important sources of material for such an experiment are:

1. Automobile magazines.
2. Local automobile agencies.
3. Automobile manufacturers.
4. Oil companies.
5. Parts and accessories distributors and manufacturers.
6. Finance and insurance companies.
7. Police department.
8. Local, state, and national safety councils.
9. Local, state and national automobile clubs and chambers of commerce.
10. Bureau of mines.
11. State tax commission.
12. State highway department.

Regardless of the type of school, the program should consist of, first, a general approach to the subject for the school as a whole, such as assembly programs, exhibits, etc., and, second, of various specific approaches designed for departments or classes.

A very brief outline of the program used at East Technical follows:

A. General Approach (for all students)

I. Assembly

1. Monday: Motion picture "The Power Within," a picture dealing with the construction and operation of the engine and other parts of the car.
2. Tuesday: Illustrated talk on "What the Owner and Operator Should

Fig. 3. A group of automobile-repair specializers preparing to explain engine operation to students viewing the exhibit later.
Fig. 4. Scale models of auto garages designed and constructed by cabinetmaking specializers

Know About the Mechanism of His Car."

3. Wednesday: Talk on "Safety" by a municipal court judge, followed by a sound picture depicting the manner in which many automobile accidents occur.
4. Thursday: Illustrated talk on "What the Owner and Operator Should Know About the Electrical Apparatus of His Car."
5. Friday: Illustrated talks on "How to Drive a Car Safely," and "Safety Inspection."

II. Exhibits: Educational and technical setups in a school garage, visited by classes and teachers according to a prearranged schedule.

III. Educational pictures and addresses relative to the automobile and subjects, attended by classes and teachers according to schedule.

IV. Educational displays of materials and literature in display cases and on bulletin boards in corridors.

The assembly programs, each 45 minutes in length and attended by the whole school were designed to give the students an elementary knowledge of the construction and the operation of a car. Such topics as "How to Use the Hand Crank," "How to Start a Car by Pushing It with Another," "What to Do in Case of Fire or Short Circuit," "How to Conserve the Battery," etc., were presented. These talks, all illustrated, and given in such a manner as to hold the interest of the audience, formed the basis of many class discussions, written and oral, especially in the English department.

The exhibits consisted of automobile parts, sectioned chassis, carburetors, knee-action units, shock absorbers, engines, axles, brakes, and tires. Some of the displays showed the step-by-step manufacture of parts, such as valves, brake lining, wrenches, gaskets, rings, tires, bearings, etc. Students, specializing in automobile repair were in charge of these displays and answered questions and explained the operation of the various units to those viewing the exhibit. Practically all this material was secured from various local agencies.

The educational pictures and addresses were scheduled to be given in the auditorium in both morning and afternoon. This program did not start until after the assembly for the day was concluded at 9:30. The pictures shown were sound movies that had a definite educational value and that had been selected from a large number submitted by various manufacturing concerns. These pictures were attended by the technical or shop classes whose work most closely correlated with the subject treated in the films. In order to facilitate scheduling the classes a short review of the film and time of showing was posted on the office bulletin board. The following is an example.

Tuesday, 9:30 (Time, 45 min.)

Subject: Manufacturing processes in Fabrication of the Ford V-Eight Automobile.

Title: A Rhapsody in Steel.

This picture deals with the fabrication of the various materials that are used in the manufacture of automobiles. Particularly good on steel drawing, pressing, rolling, forging, and heat treating, exceptional sound effects by the Ford Symphony Orchestra.

Tuesday, 1:20 (Time, 1 hr.)

Subject: The Economic Correlation of the Automobile with Other Industries

Title: The Great Circle

This picture deals with the economic influence of the automobile industry on the other allied industries, such as wood, steel, rubber, paint, etc.

Some of the other subjects used were: "Lubrication, The Engineering Features of the Automobile, Refining Automobile Fuels and Oils, Rubber Productions and Tire Manufacturing, Automobile Bodies and Airflow, Safety Features of the Modern Automobile.

B. Specific Approaches — Departmental Programs (Academic Division)

I. Health Department
   1. Physical characteristics of a good driver
      a) Body: Position, eyesight, hearing, general health
      b) Mind: Reaction time; emotional stability; attitude; judging distances; automatic driving; distractions; fatigue; distribution of attention on intersections, side of road, approaching cars, etc.
      c) Recreation: Vacation travel; leisure time (camping, hiking, hunting, etc.); municipal, state, and national parks and other points of interest reached by auto; travel aids (maps, guides, etc.); out-of-country driving; ownership papers; custom regulations; etc.
   2. Vital statistics: Number of accidents in city, state and nation for past several years, analysis of accidents, statistics regarding cause, cost, time, type, etc.
   3. Effects of auto on health: Medical aid, sanitation, urban congestion, etc.

II. Social Science
   1. Effects of the automobile on society, changes in agrarian and urban family life, schools, crime, recreation, centralizing, and decen-

tralizing influences, employment, communication and transportation, etc.

2. Taxation related to the automobile; national, state and local problems involved in collecting and distributing of gas tax, use of gas tax, etc.
3. Traffic laws and regulations relating to pedestrians, street cars, school and other bus drivers, street regulations, state regulations, right of way, miscellaneous regulations, procedure in traffic court.
4. Automobile insurance: Liability, property damage, collision, fire, theft, other types of insurance, cost of insurance, necessity for understanding limitations and other provisions of policies.
5. Automobile accidents: Local, state, national. Analysis of accidents into types, time, age of driver, etc., suggestions for reducing accidents, what to do when an accident occurs.

III. English

1. Vocabulary, spelling, pronunciation, and meaning of various automotive terms.
2. Written and oral reports on such subjects as: Leaders in the Automotive Industry, Growth of the Automotive Industry, Useful Driving Hints, Hopping a Car and Thumbing a Way, Cooling Systems, Recent Developments, Why I should Buy a ——— (certain make of car), Selling an Auto, How I Learned to Drive, Why I Wish to Own an Auto, The Farmer and the Automobile, Giving Directions, etc.
3. Informal debates on such propositions as: That the auto is a social menace, that autos should be made to run no faster than 50 miles an hour, that the gasoline tax is a fair means of taxation, that a used car is more economical than a new one, etc.
4. Oral discussion: What I Learned From the Exhibit or Assembly Program.

IV. Science

1. Biology: Physiological effects of alcohol related to driving, general health and driving, need for adequate ventilation of garages, vital statistics, etc.
2. Elementary chemistry: Lectures, discussions, demonstrations of chemistry in the auto industry, fuels, oils, rubber, metals, etc., laboratory work in connection with classwork.
3. Physics: Friction related to brakes, tires, and air. Simple machines found in the auto, laboratory experiments on coefficient of friction of various types of brake lining and tires on various types of pavements, both wet and dry, experiments related to the electrical system.
4. Radio physics: The auto radio.

V. Mathematics

1. Arithmetical problems relating to original cost, operation, upkeep, depreciation, gasoline, oil and tire mileage, financing, insurance, piston speeds, piston displacements, clearances, discounts, decimal equivalents, gear ratios, etc.
   Example: A car you wish to buy is priced at $782.75, sales tax 3 per cent, bill of sale, $2, license, $10, transfer of title and notary fee, $1.40. Find amount of sales tax and total cost. If you make a down payment of $279.64 and sign a contract to pay $606.36 in 12 equal payments, what would be the amount of each payment, the cost of financing, and rate of interest paid?
2. Graphical representation of sales, costs, vital statistics, stopping distances for various speeds, etc.
3. Problems involving formula such as the various methods of calculating horsepower, piston displacement, stopping distance, electrical calculations, efficiency, etc.
   Example: Compare the stopping distances of cars equipped with 2- and 4-wheel brakes respectively, and traveling 30 miles an hour. Traveling 60 miles an hour. Stopping distance (av.) $= \frac{M.P.H.^2}{18}$ for 4-wheel brakes.
   $S.D.$ (av.) $= \frac{M.P.H.^2}{10.8}$ for 2-wheel brakes.
4. Problems involving geometry: Steering geometry, valve and ignition timing, piston speeds, etc.
   Example: At what points in an up-and-down stroke will a piston be traveling fastest? Make a geometrical proof of your answer. How will the length of the connecting rod affect the position of greatest speed?

The shops, having the necessary physical equipment, provided a means for teaching the mechanical phases of the automobile and related products. The longer periods usually devoted to the shopwork enabled many of the teachers not only to teach the material that could be directly correlated with their work, but also to devote some time to such subjects as "Trouble Shooting for the Car Owner and Operator," "Correct Driving Procedure," "Safety Inspection on the Automobile," "Minor Maintenance and Repair Procedures," etc. This arrangement worked satisfactorily, as many of the shop teachers naturally had an interest in the mechanical operation of the automobile and were familiar with many of the tools and procedures. Specializers in the auto-repair course were called into many of these classes to answer questions and make demonstrations.

I. Wood Shops

1. Garages: Types, materials, floors, size, workbenches, tool cabinets, doors and controls, roofing, etc.
2. Patterns for auto parts.
3. Interior trimmings, duplication of metal panels resembling wood.
4. Character and application of paints, varnishes, lacquer, etc.

II. Machine Shop

1. Relation of machine shop to the automobile manufacturing industry.
2. Machine operations in the manufacturing of an engine and transmission.
3. Machine operations in a repair garage.

III. Sheet Metal

1. Sheet-metal parts of an automobile.
2. Procedures of making and repairing of sheet-metal parts.

IV. Foundry

1. Castings and procedures in an automobile foundry.

V. Printing

1. Layout of advertising materials, etc., relative to the automobile.

VI. Art

1. Applied Art: Models of interior fittings and ornaments.
   Commercial Art: Outdoor and indoor bulletins and displays.
   Industrial Art: Restyling and designing of cars in color.

VII. Drawing

1. Elementary: Working drawings of automobile parts.
2. Engineering: Pavement, types, materials, characteristics, highway marking systems, street and safety measures.
3. Architectural: Designs of sales and service buildings, filling stations, parking lots, trailers, tourist camps, hot-dog stands, etc.
4. Machine: Machine drawing and the automobile industry, drawings of automobile parts and wiring diagrams.

VIII. Industrial Chemistry

Individual instruction and laboratory work on:

1. Fuels, types, analysis comparisons, distillation of crude oil.
2. Antifreeze compounds, analysis comparison, properties.
3. Alloys, variety, analysis, characteristics.

Visual aids were used extensively in connection with the technical program. Many of the shops utilized demonstrational materials used in the regular auto-repair

classes. Charts, booklets, and actual parts of the automobile, still and motion pictures, were used by each class. Three classrooms were equipped with shades and screens for showing motion pictures. These films were of the 16-millimeter silent type, secured from the U. S. Bureau of Mines Experiment Station, located in Pittsburgh, Pa. The titles of the film shown were: Story of Gasoline, Story of a Storage Battery, Story of Iron, Story of Lubricating Oil, Carbon Monoxide (safety), Automobile Lubrication, Making an All-Steel Body, The Metals of a Motor Car.

Students specializing in stage craft set up and operated the projectors for these films as well as those shown in the auditorium.

Another type of film that was available and used by some of the shop teachers was the 35-millimeter silent-strip film (still pictures). A list of those available was posted, and shop teachers booked those they wanted for use in their shops or theory room. Some of these titles were: The Steering Gear, The Carburetor, The Cooling System, Heat Treatment of Metals, The Fuel System, The Engine, The Transmission, Cold-Weather Lubrication, The Clearoil Process (Oil), The Differential and The Clutch. Many of these films were owned by the automotive-aeronautics department, while others were borrowed from various companies or agents located near the school.

Results

The general consensus of opinion of both faculty and student body was that the beneficial results of the experiment far overbalanced any that could be considered as negative.

The beneficial phases may be summarized as follows:

1. The student body of the entire school was drawn together into a more compact unit, centering attention upon one common subject which formed a basis for mutual discussion and study.
2. Many students were brought to realize the extent to which the principles taught in the various academic classes could be used in everyday life.
3. Much of the subject matter in the various courses was vitalized and motivated by correlating it with an object of universal interest.
4. The search for subject matter revealed material that is of more value to the students than that previously used.
5. The students learned many facts pertaining to the use and operation of the automobile that will make them more intelligent buyers, owners, and operators.
6. Various teachers found demonstrational material and reading matter that will be a permanent instructional aid.
7. Increased co-operation between shop and academic teachers.

Class Personnel Organization

Stanley S. Radford

Arthur Hill Trade School, Saginaw, Michigan

A very helpful and practical article on how to institute a shop personnel organization in the school shop. While the author applies his explanation to the work in the drafting room, the suggestions which he makes can be applied equally well in any other type of school shop.

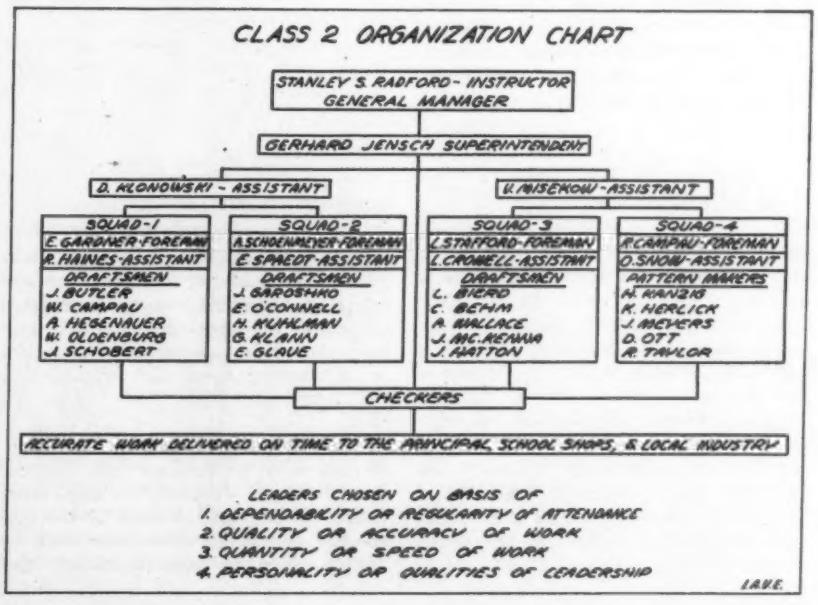
When an instructor is faced with the problem of large classes, he is immediately concerned with the question of how best to help those students who need it most at the time when they need it. He also has an increase in the amount of work to be checked and graded, take, for instance, in a drafting class, both as to written answers and as to drawings assigned with each job.

In order to do a real piece of instruction, it is essential (1) to give helpful suggestions to students having difficulty in reading job specifications, answering their questions, etc., and (2) to thoroughly check all student work at the time of completion as to its accuracy, pointing out mistakes for correction so as to avoid the same mistakes being made on succeeding jobs. When the volume of work becomes more than one instructor can possibly keep up with as to instruction and checking, the only solution is to organize each class as a unit, using the more capable and dependable students as leaders or assistants.

Selection of Student Leaders

The important point to consider in organizing any class is the careful selection of all student leaders. If the instructor is unfamiliar with the personnel of a new or beginning class, it is best not to be in too great a hurry in selecting class leaders. *The success of organized effort depends upon the quality of its leadership.*

A good way to determine the quality of student leadership available in any class is to set up a point basis upon which leaders are to be chosen, and announce that leaders will be chosen ac-



cording to this standard at the end of a probationary period of one month. This probationary period will give the instructor plenty of time to determine on the basis of the record made by the students in each class, those most suitable or desirable for positions of leadership.

Personnel Organization Chart

A sample personnel organization chart for a beginning class of 31 students in the trade drafting department is submitted. The chart is largely self-explanatory, showing the number of officers in the staff organization and giving the point basis by which leaders are selected for the various offices. The leaders are selected to hold office for a period of one semester or one year according to the discretion of the instructor.

Division of Duties

After the organization is set up in chart form, it is necessary to list all the most essential duties to be performed for efficient class operation. These duties should then be divided among the various class officers so as not to place too much responsibility on any one officer. A sample list of specific duties and the division of duties for the officers of a trade drafting class is given as an aid to other teachers who may be interested in organizing their classes on a similar basis. While responsibility for class management is fixed upon the class superintendent, yet it will be noticed that while he is responsible for all of the duties being performed, he actually does only those things which are not assigned to the other officers. After the duties are carefully explained to each officer, the instructor must check up to see that these duties are performed in a satisfactory manner day by day.

Duties of Class Officers

Class Superintendent

It shall be the responsibility of the superintendent to see that the following duties are performed in a satisfactory manner each day.

1. See that an accurate check of attendance is made at the beginning of the class period and *send a report of absence or tardiness to the central school office within the first 5 minutes after the last bell rings.*

2. See that trays containing instruments and tools are properly checked out at the beginning of the class period and that a *very careful check is made to be sure that such equipment is in place at the end of the class period.*

3. See that special equipment (such as irregular curves, protractors, large triangles, etc.) is properly issued upon student request and that such equipment is in place at the end of the class period.

4. See that paper supplies, textbooks, etc., are properly issued at the beginning of the period and checked in proper place at the end of the class period.

5. Be responsible for efficiently carrying on the work of the class in case of temporary absence of the instructor. The superintendent shall act in an advisory capacity, giving helpful suggestions and guiding all other class officers in such a manner as to secure performance of duties efficiently.

6. It is the duty of the superintendent to promote the general welfare of the class by reporting any student who violates any of the department rules and regulations. *Any student who is a disturbing element or "a nuisance" to others, after fair warning, shall be reported directly to the central school office without delay.*

7. Assist the "instructor" in the accurate checking of student drawings and written answers to job questions, pointing out mistakes for correction at the time each job is completed. All drawings shall be corrected before being placed in the filing cabinet or being sent to the school shops for use.

8. See that any special project or job assigned by the instructor is carried through to successful completion, for example, the making of blueprints to fill orders received from local industries, etc.

9. See that *clean-up duties are properly performed by each foreman and the workmen in his group at the end of the class period.* Clean-up duties involve the picking up of wastepaper around the drawing benches; that all reference material and scientific magazines are arranged neatly in place; that the washbowl is clean, and the room in general to present a neat and tidy appearance.

10. *To bring to the attention of the instructor any complaints or constructive suggestions made by students relative to the work of the class,* so as to promote co-operation, shop safety, and the general welfare of each member of the class.

Assistant Superintendents

1. It shall be the duty of each assistant superintendent to assist the superintendent in every way, to put into operation any orders or reasonable requests transmitted to them by the superintendent and to promote the efficient operation of the class by encouraging co-operative group effort and individual student effort within the class.

2. The two assistant superintendents to be responsible for accurate daily performance of duties 2, 3, 4, and 7 as listed under duties of the superintendent and in the absence of the superintendent shall be jointly responsible for the efficient conduct of the class by performing all other duties of the superintendent.

3. The assistant superintendent shall be responsible for the work of the foreman, assistant foreman, and workmen of each squad or group under his direction as indicated by the class-organization chart.

Duties of the Foreman and the Assistant Foreman

1. It shall be the duty of the foreman and his assistant to transmit any orders or reasonable requests made by the superintendent or assistant superintendents to the workmen in their group or squad.

2. The foreman and his assistant are to act in an advisory or helpful capacity to the workmen in their squad, giving suggestions as to methods of attack to a workman having difficulty, pointing out errors, and helping the individual student to improve his daily work.

3. The foremen and their assistants shall be responsible for the efficient performance of *duty No. 9* (clean-up work as listed under duties of superintendent) at the end of each class period.

4. It shall be the duty of the foremen and the assistant foreman to promote "good will" among the workmen and *co-operate in every way possible with the* superintendent and his assistants *to improve both the quality and the quantity of work produced by the class.*

The Class Spirit

By careful training and guidance of class leaders and student workmen as to the value of organized effort, the spirit of teamwork can be encouraged. Student workmen soon become aware of the fact that their class officers can often prove helpful to them by the hints or suggestions given as to methods of solving difficult problems, the answering of questions in case the instructor is not available at their time of need, and by pointing out mistakes in projection or omissions on their drawings. The direct contact between class leaders and *student* workmen is good for both. Both groups of students learn from each other, and learn to express what they know in the exchange of ideas and thought. It will be noted that with a third of the class in positions of leadership, the burden of carrying on this type of individual and group instruction does not fall heavily on any one of the various officers. It will also be noted by the organization chart that all student drawing work is carefully checked for errors at the time of its completion by the class superintendent and his two assistants according to a "Guide for Checking Errors." This work of checking is supervised by the

instructor and all final grades or marks are determined by the instructor based on a system of averages, which works alike for all students regardless of whether they are student officers or not.

As soon as the class organization is functioning successfully with all the officers and workmen "on their toes," the quality and quantity of student work improves with a corresponding increase in pride and interest in work well done, and in the spirit of the class as a whole.

Assumption of Responsibility

As the individual members of the class learn to assume responsibility, each co-operating and doing his part in "carrying through to successful completion the assigned tasks," this quality of individual and group loyalty and assumption of responsibility is likely to become a habit. Employers are interested in having employees who are thoroughly loyal, dependable and capable of assuming responsibility, on the job. Students should be interested in the attainment of such qualities along with a mastery of trade knowledge and technique or skill.

The final test of whether an efficient student organization has been built up is whether or not the organization can function successfully in case of the temporary absence of the instructor from the classroom. Once students have been taught to assume responsibility, and are interested in improving their work, and want their school to have a good reputation in the community, they are quick to grasp the idea "that the class should *carry on*" as a unit in the school organization in the absence of the instructor just the same as "honest workmen in a factory organization *carry on* during a temporary absence of a foreman." It can be pointed out that the work is not stopped in a factory due to the absence of a foreman as his assistants and workmen do their work to the best of their ability just the same. The same condition should exist in a similar situation in the classroom.

Summary

Organizing the personnel of each class as a unit is helpful to both the students and the instructor and should result in more and better work being accomplished by a large class than would otherwise be possible. This class personnel organization is justifiable according to modern principles of education in that it provides an opportunity for teaching students in a practical way (1) the meaning of individual and organized group effort, (2) co-operation or working harmoniously for the common good of all, (3) the assumption of responsibility for efficient operation of the class as a unit in the school organization, and (4) familiarization with the line or staff organization as it is commonly used in industrial-plant management.

Finally, successful organization of any class of students means careful selection of student leaders, with training and guidance of both leaders and student workmen alike by the instructor. The instructor must be constantly "alert and on the job" to avoid "friction" between student personalities in order to create an efficient working organization.

Industrial-Arts Teacher of the Future

James E. Hopkins

Director Industrial Arts,
South Orange and Maplewood,
New Jersey

The personal interest of the shop teacher in his students will assist him in adjusting his educational offerings to them as individuals rather than as component parts of a group.

Wherever school administrators gather, discussions may be heard about changes to be made in our school organization, and statements are made about adapting work to the individual needs, about character education, and about hiring teachers who are more than just subject specialists. Many of these points under discussion are not new but there does seem to be more general emphasis of the fact that intimate knowledge of the student as an individual comes first, and content and methods of education follow after. Assuming that at least a part of the educational changes which will take place in the near future will depend for their success on a greater knowledge of and more careful adjustment of the individual student, let us take stock of the part to be played by the teacher of industrial arts in this picture.

The teacher of industrial arts is in a better position than anyone else in the school system to find out about the problems of individual students, and to assist in their solution if he is interested in doing so. In the first place, most of those enrolled for this work enjoy it, and this assists in creating a pleasant relationship between teacher and student. In the second place, the shop situation, if properly organized, is an informal one. The student is given opportunity to react honestly to a variety of situations, and his reactions may be most revealing to an observing instructor. Then, too, many of the boys come in after school and often discuss their problems either with the other boys in the presence of the instructor, or directly with the instructor. If the instructor is a real friend to these boys, and is qualified to take full advantage of the opportunity which is within his grasp, he will become one of the most vital parts of the school organization.

The successful industrial-arts teacher of the future will be the one who equips himself, through a study of mental hygiene and psychology, to deal wisely with the many problems of the adolescent boy. He will not only get more satisfaction out of his work but will find that he is respected in the general educational setup much more than he could ever hope to be as a subject specialist.

PROFESSIONAL CONSIDERATIONS

No statement of industrial-arts objectives would be complete without a final statement of their application and relationship to the rest of the school. This involves the teacher's attitude toward his work, the pupil, the school, and the community.

It seems evident that the industrial-arts program should include plans for developing desirable relationships with other organizations sponsoring boy interests, such as the Boy Scouts, camps, vacation-school programs, hobby fairs, and the like. — *The Ohio Prospectus.*

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

A Worth-While Addition

At the Denby High School in Detroit, Mich., a handicraft shop, the work of which covers two semesters and offers a total of five years of credit, has been introduced. The following six activities are offered in this shop: bench metal, sheet metal, art metal, electricity, weaving, and pottery. The normal class capacity is 36 students every period of the day. In addition to this, provision has been made to take care of five students per period who are not enrolled in classes but who want to engage in hobby work. The course taught consists partly of required, and partly of optional work. Work done at home is encouraged by extending credit for it, the only requirement being that some phase of it has to be done at the school. Special emphasis is placed on the utilization of scrap or waste material and quite a number of projects from discarded things found about the home, have been made since the class was started.

Some of the work produced by the students in this course was displayed at the 1935 convention of the National Council of Catholic Women at Fort Wayne, at the Northeastern Y. M. C. A., during the Kiwanis pet and hobby show, and at the boy-scout rallies in the city of Detroit. It has received a great deal of favorable comment which proves the worth of the experiment, and shows the ease with which the school shop can extend its influence beyond the confines of the school.

Industrial-arts teachers the country over, may well try to emulate the example set by this Detroit school, and thus help materially in bringing home and school in closer contact and in making their communities conscious of the value of industrial-arts work.

Training Our Future Craftsmen

As business and industry are slowly reviving, industrial leaders are beginning to recognize the dearth of skilled artisans available in the various trades.

The master-carpenters association of one of the larger midwestern towns, seeing the handwriting on the wall, have made a study of their situation. Their findings show that not a single carpenter apprentice was indentured during the past five years. Their records also show that deaths, old age, and shifts to other occupations, have so depleted the ranks of the carpenters that the average age of the journeymen at present is 54 years. Five years ago, the average age was 45.

This is a serious state of affairs and requires an immediate remedy. Statements have already been made accusing the school of having neglected its duty in not preparing skilled men for the trade. Businessmen and industrialists have short memories. They have forgotten that during the lean years they seriously hampered and almost destroyed industrial arts and vocational education in many school systems by reducing budgets for shopwork in schools. Some of these cuts were so extreme that the work barely could be carried on.

Of course, there were businessmen, writers, and even teachers who prophesied that specialized trade training would be a thing of the past. Nevertheless, industry is again scanning the country for qualified carpenters, masons, plasterers, plumbers, patternmakers, coremakers, foundry men, machinists, toolmakers, and tradesmen of other kinds.

Naturally, the school will endeavor to do its share in the training of competent craftsmen. Unfortunately, however, most school systems still have to contend with a mere vestige of what was formerly allowed them for the purpose of conducting industrial courses.

In spite of the handicaps placed upon them, educators in the field of industrial arts and vocational education have striven to maintain a high standard of work. It is safe to say that they will continue to serve to their utmost capacity, and that they also will study their ever-changing problem and change their courses whenever conditions will require this.

One of the methods for training craftsmen which deserves serious attention right now is that fostered by the Federal Committee on Apprentice Training. This body is doing much to make the training of our future craftsmen a venture in which industry and school can successfully co-operate. The scheme is new as a national venture, but it has been successfully applied in some states for quite a number of years. It should be carefully studied as to its possibilities and should receive the whole-hearted support of educators who have the opportunity to adopt it in their own communities.

The George-Deen Act

On June 8, the President of the United States signed the George-Deen vocational law, which will become effective July 1, 1937.

This enactment provides a development of vocational education beyond that already afforded by the Smith-Hughes Act. The opportunities thus opened do not only grant increased appropriations, but provide for types of vocational training not heretofore included in the earlier vocational-education laws. The fact that the law does not go into effect until next year, provides educational leaders with time to study the situation in their respective states so that proper plans can be laid for the effective use of the funds provided by this Act for the vocational preparation of youths and adults in the United States.

The principal features of the Act may be summarized as follows:

1. Appropriation of $12,000,000 annually for agricultural, trade and industrial, and home-economics education, the sum specified to be divided equally among these three fields.

2. Appropriation of $1,000,000 annually for the training of vocational teachers.

3. Appropriation of $1,200,000 for training for the distributive occupations.

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4. Authorization of these appropriations on a permanent basis.

5. Fifty per cent of the federal funds may be used without matching until 1942.

6. The appropriations may be used for salaries and for necessary traveling expenses of teachers, supervisors, and directors.

The vocational educators of this country should not overlook the fact that this new Act offers great opportunities for the development of the educational work in their field, and that the country looks to them for wise planning, and careful administration and use of the money placed at their disposal.

A Real Need

In the May, 1929, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, there appeared a study of drafting-room practices made by H. D. Campbell of the J. Sterling Morton High School, Cicero, Ill. This study gave a picture of the practices adopted in the drafting rooms of 130 representative industrial plants at that time. The American Standard of Drawings and Drafting-Room Practice was approved in May, 1935, by the American Standards Association. A summary of these standards was made by H. A. Sotzin, "Drafting-Room Practice," and is published on page 267 of this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. In the March, 1936, issue, there appeared another survey of drafting-room practices. This was made by F. R. Kepler, Supervisor of Mechanical Drawing, Detroit, Mich., and his committee for the Michigan Industrial Education Society. Mr. Kepler's study shows the practices adopted by 116 firms.

All of this material contains information that is of vital importance to drafting-room teachers, irrespective of whether they are teaching in the grades, the junior or senior high school, the junior or senior college, or the teacher-training institution. It is quite necessary that teachers of drafting study and adopt the results of these studies and the pronouncements of the standards as they are laid down. There may be divergence of opinions on some of the practices that have been approved but it is better to adopt them just as they are for the sake of uniformity.

Industry and commerce frequently make the general assertion that the schools fail to train youth for entry into the workaday world. As usual, some of these assertions are made with little real knowledge of the facts, and frequently are not even generalizations based on observation. They are so often merely the utterances of men who have been more or less successful in their particular field and, therefore, look upon themselves as experts on any question that may be proposed, especially so if it has anything to do with education.

There is some truth, however, in the statement that teachers, on the whole, are slow to adopt new practices inaugurated by industry. This very deliberateness may possess some merit, because the new practices adopted by industry frequently affect only a small percentage of workers — industry itself being quite slow in adopting changes found helpful by some of its own members. The American Standard of Drafting-Room Practices, however, has not been hastily adopted. It is the result of a slow, laborious process of gathering information, studying the findings, and then arriving at a conclusion. It deserves recognition and immediate adoption in every school drafting room. It was approved more than a year ago and yet many teachers do not seem to know anything about it. Its adoption may mean a revamping of many courses now taught, and there is the rub — we mortals do so hate to change our habits. It is necessary, however, that all drafting teachers recognize these standards, and adopt them for use in their drafting courses at once.

Especially must this be done by the drafting teachers in teacher-training institutions. It is in their classes that the future teachers who are to use the standard drafting-room practices are being trained. If the student teachers are correctly taught, there is every reason to expect that they will go out and teach the subject that same way. That this has not been done consistently in the past may be judged by the remark recently made by a supervisor of industrial arts in one of our larger cities: "In order to have mechanical drawing taught in our school system in such a way that our industries cannot criticize us, we have found it necessary to require every teacher of drafting whom we engage, no matter where he was trained, to take special evening drafting courses."

This is an indictment which is quite damaging. While the requirements for teaching a subject might vary somewhat from one school system to another, nevertheless, it ought not be required that the school system expend money to retain beginning teachers in such a common subject as drafting.

Personal observations have convinced the writer that many teachers have never been impressed with the necessity of following a given drafting method consistently. Take, for instance, the American practice of using third-angle projections only. It is not uncommon to have drawings submitted for publication in which some details show first-angle and others third-angle projections. This failing is particularly obnoxious to industry where a drawing made with a first-angle projection may mean the loss of considerable money.

Another point that seems not to be sufficiently emphasized in the training of drafting teachers, is the need for dimensioning drawings correctly. It also frequently happens that dimensions on drawings made by teachers are so placed that it is almost impossible to read them. Such illegible dimensions lead to errors and should not be tolerated.

It is true, of course, that many students who take up mechanical drawing at school will not become draftsmen, yet while they are learning something about what the draftsman does for a living, and how he does it, they by all means ought to get their information correctly. The adoption of approved drafting-room practices by all instructors teaching this subject will prove of greatest assistance all round and it ought to be done without further delay.

Casting in the School Shop—VI

N. A. McMillan
Elmira, New York

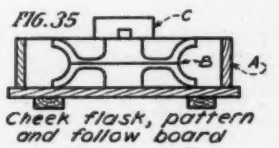
The sixth of a series of lessons on molding. For previous lessons see January and September, 1934, May and October, 1935, and April, 1936, issues of this magazine.

ADVANCED TYPES OF MOLDING

The following types of molding are mentioned merely to acquaint the student with these practices, and to show that besides the work already performed, there is much more to be learned to become a molder. References are given so that a student may find out more in detail about these processes.

Molding in a Three-Part Flask

Refer: *Foundry Work*, by Stimpson and Gray, pages 44–46.



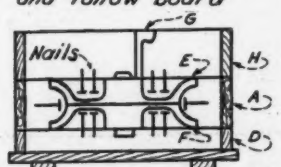
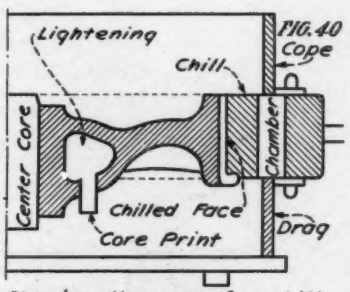
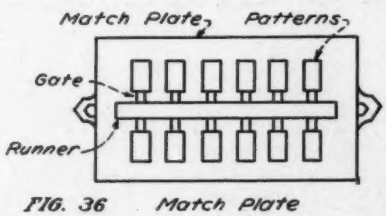
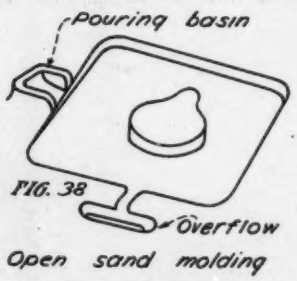


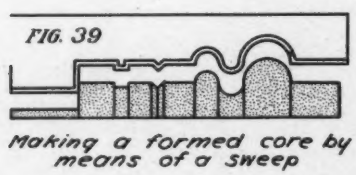
Figure 35 shows a sheave pattern that is to be cast in a three-part flask. The pattern is laid on the mold board in the center of the cheek A, as shown in the upper part of Figure 35, the parting of the pattern to come at B. The cope core print is loose so that it can be removed to permit the pattern to rest flat on the follow board. The cheek is rammed up around the pattern. This tends to force the two halves of the pattern apart and thus makes the sheave thicker than desired. To prevent this, the weight C is placed on top of the pattern (see upper sketch, Figure 35), while the cheek is being rammed. After the joint in the cheek is made, the drag D is placed and rammed up, nails being placed as shown. The cheek and drag are rolled over together and the second parting is made, after which the cope is rammed up, nails being set as shown. The cope is lifted off and the portion E of the pattern is drawn, after which the cheek is lifted off, set aside, and the portion of pattern F drawn. After the core is set, the gate is arranged as shown at G in the Cope H.

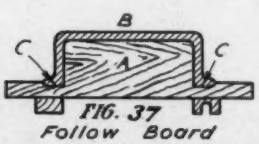
Match Plate Molding











Refer: *Foundry Practice*, by Palmer; pages 228–233, also *Foundry Work*, by Stimpson and Gray, pages 65–67.

In Figure 36 are shown several small patterns duplicated and fastened to a plate called a match plate. Half of the pattern is on the drag and the other half in the cope.

In this case a single pattern is made called a *master pattern*. Double shrinkage is allowed, also material left for cleaning up the metal pattern (Aluminum). Then sixteen halves are cast, cleaned, and gated as shown.

This method is used for mass production of small castings. One can see that eight patterns can be rammed up as quickly as one pattern. There are no gates or runners to cut as they are formed in the mold when ramming.

Irregular patterns can be cast the same way thus saving time in coping down, because the parting line is already established.

Advanced Types of Molding

To speed up the making of small cores for such patterns as are shown in Figure 36, a gang core box is made. Then instead of filing a single box, a series of cores are constructed in one unit. It does not take much longer to ram up six or eight cores than it does one.

Follow Board

The purpose of a follow board is to establish a parting line on an irregular pattern and support same when ramming the sand.

Figure 37 shows a cross section of a machine guard. If pattern B were to be set with the edges CC resting upon the molding board, and the sand of the drag rammed down upon its upper face, it would be sprung out of shape. To avoid this, a follow board A is made to fit the underside of the pattern. When the cope is rammed the follow board is removed and the drag sand supports the pattern.

As is plainly seen, the parting is made which saves time when several castings are to be made.

Floor Molding

Refer: *Foundry Practice*, by Palmer, pages 30–46.

The work performed so far in this course, has been accomplished with small flasks on a bench. Floor molding permits the casting of very large pieces.

Large flasks are used; some are built

with a brick wall, in loam molding, and others poured in open sand molds as illustrated in Figure 38. Here, as you see, there is no cope.

Loam Molding

Refer: *Foundry Work,* by Stimpson and Gray, pages 70–79; also *Foundry Practice,* by Palmer, pages 161–180.

The loam molder requires the greatest all-round skill in the whole range of foundry work. He must know all the tricks of the core room and of the dry-sand shop besides those encountered in green-sand molding. He must have a practical working knowledge of the principles of drawing and must possess to a large degree the foresight of the designer.

Larger and heavier castings are made in loam molds, as this class of mold is swept up, and requires less pattern work than any other class of molding. Figure 39, shows a core being formed with a sweep or strike, also, at times, called a strickle. A loam mold consists essentially of a brick backing built up on cast-iron plates, the surface of the bricks being covered with loam which is swept to the proper size and shape to form the finished mold. The loam is baked on the bricks after the mold has been finished. Castings weighing many tons are poured in this type of mold and include engine cylinders, flywheels, and similar heavy castings.

Dry-Sand Molds

Refer: *Foundry Practice,* by Palmer, pages 121–153.

Dry-sand molds are used for intricate castings, such as steam- and gas-engine cylinders, or castings that require accuracy, thin thickness of metal, or fine details. The sand will not break as the molds are baked in an oven and will stand up under severe usage.

There is no moisture as in green sand therefore air holes are practically eliminated.

Dry-sand molds are used for non-ferrous castings, bronze art work, statues, and other work where fine detail or smooth surface must be maintained.

Chilled Casting

Refer: *Foundry Practice,* by Palmer, pages 98–103.

One of many types of castings made with a cast-iron chill is the car wheel shown in Figure 40. Between the cope and drag mold, a cast-iron rim is placed in position. This makes a combination of sand in the cope cast iron in the center or cheek and sand in the drag. The chill forms the rim of the wheel, which is accurate and makes a tough wearing surface.

The iron poured into the mold and running against this face of the chill, cools rapidly, thus producing a hard white surface about ¾ in. deep at the tread of the wheel.

Molding Machines

Refer: *Foundry Practice,* by Palmer, pages 254–290; also *Foundry Work,* by Stimpson and Gray, pages 51–68.

As in all other industries, machinery has been installed to cut down costs or take the place of hand operations in molding.

The chief operations performed by molding machines consist of ramming the sand into the mold, rolling the mold over, and drawing the pattern. Ramming the sand into the mold by hand is a slow process. The pneumatic rammer increases the amount of ramming a man can do. In molding machines the whole flask may be rammed at one time, or the filling and ramming may be accomplished at one time.

Problems and Projects

ELECTRICAL TEST

H. J. Johnson, Duluth, Minnesota, East Junior High School

This is Section IV of this test. Section I appeared on page 139 of the April, 1931, issue of this magazine; Section II, page 226 of the June, 1931, issue, and Section III, page 262 of the July, 1931, issue.

Each section contains 50 questions.

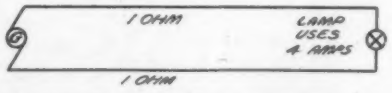
Section IV

Name..... Class.....

151. The line telegraph transmits a series of signals called ..... and .....
152. In a telegraph circuit, the line currents are made to send out a new local current at each station by a device called a .....
153. The telephone does not transmit voice or sound waves, but changes sound waves to electric .....
154. A telephone circuit consists essentially of the following parts: ....., ..., ..., ..., ..., and .....
155. In wireless telegraphy, no sound passes through the air, but a high-frequency current called a .... passes through the ether.
156. Wireless signals were formerly sent out by the discharge of a ....
157. A crystal detector rectifies the currents received but does not ..... them.
158. Adjusting the receiving circuit to the same wave length as the transmitting circuit is called .....
159. The wave length of a broadcasting station is generally given in .....
160. The frequency of the current being broadcast is given in .....
161. A tube detector rectifies and also ..... the current.
162. Tubes preceding the detector in a receiving circuit are called ....
163. Tubes following the detector in a receiving circuit are called ....
164. When the current is fed back through some of the tubes the circuit is said to be ..... circuit.

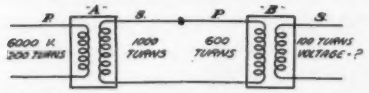
165. Draw in the parts of a triode vacuum tube.
166. Draw in connections for a simple crystal receiving circuit:

167. Aerials should be provided with grounding switches or lightning arresters to prevent dangerous charges due to .....
168. Voltage drop in a circuit is pressure used up in forcing current through the .... of a circuit.
169. The voltage drop in a given wire depends upon the ..... through it and its .....
170. Power loss in a circuit is measured in .....
171. The power loss in a given wire is the product of the .... the .....
172. Calculate the voltage drop in this circuit. Answer: ..... volts.

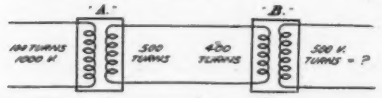


173. What is the power loss in problem 172? Answer: ..... watts.

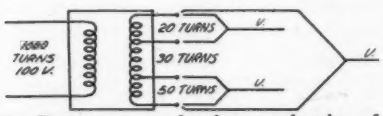
174. There is some power loss and some voltage drop in every circuit, because all wires have .....
175. Power is transmitted long distances at high voltage because smaller .... may thus be used.
176. What would be the secondary voltage of transformer B in this circuit: Answer: ..... volts.



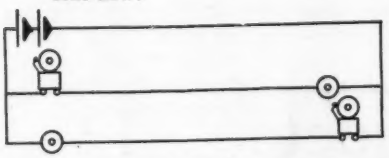
177. How many turns constitute the secondary winding of transformer B in this circuit: Answer: ..... turns.



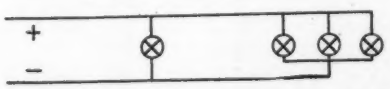
178. Mark the secondary voltages across the various terminals in this diagram:



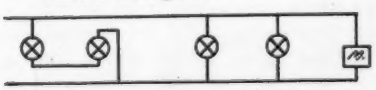
179. Draw an arrowhead on each wire of this circuit showing direction of current flow:



180. Suppose each lamp in this diagram uses 1 ampere. Mark upon each wire the amount of current which flows through it.



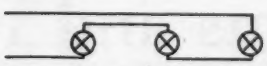
181. In this circuit, each lamp is receiving one ampere and the motor 4 amperes. Mark upon each wire the amount of current through it.



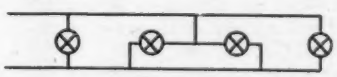
182. Diagram the connections for determining the current and voltage of this circuit:

Insert the word "series" or "parallel" in each of the blank spaces in the following statements.

183. Christmas-tree lights are commonly connected in .....
184. A single-pole switch is in ..... with the lamp it controls.
185. Three-way switches are in ..... with each other.
186. A double-pole switch is in ..... with the feeders.
187. Automobile headlights are connected in .....
188. Several bells to be rung together are connected in ..... with each other.
189. An ammeter is always connected in ..... with the device being tested.
190. A voltmeter should be in ..... with the device tested.
191. The cells of a flashlight battery are in .....
192. Fuses are in ..... with the main line.
193. Street cars of a trolley system are in ..... with each other.
194. A circuit-breaker is in ..... with the line it protects.
195. Blowing the neutral fuse of a three-wire system throws the two sides of the circuit into .....
196. The cells of a radio B battery are in .....
197. To reduce the current in a circuit, additional resistance may be connected in .....
198. Tapping an additional member across the two main feeders constitutes a ..... connection.
199. The lamps in this circuit are connected in .....



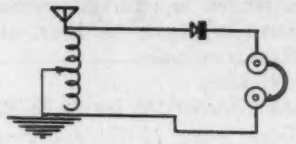
200. This diagram represents a ..... circuit.



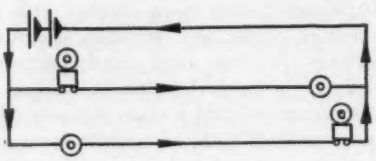
Answers to Electrical Questions

151. dots and dashes
152. relay
153. currents
154. transmitter, receiver, induction coil, condenser, bell, and battery
155. Hertzian
156. spark gap
157. amplify
158. tuning
159. meters
160. kilocycles
161. amplifies
162. radio frequency amplifiers
163. audio frequency amplifiers
164. reflex
165.

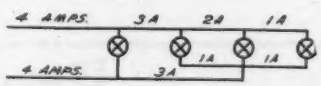
166.



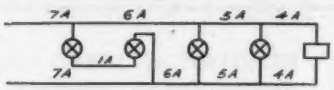
167. lightning
168. line wires
169. current, resistance
170. watts
171. voltage drop, current
172. 8 volts
173. 32 watts
174. resistance
175. wires
176. 5000 volts
177. 40 turns
178. 2, 5, 10
179.



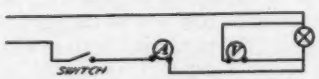
180.



181.



182.



183. series
184. series
185. series
186. parallel
187. parallel
188. parallel
189. series
190. parallel
191. series
192. series
193. parallel
194. series
195. series
196. series
197. series
198. parallel
199. series
200. parallel

CANDY DISH

Joseph J. Lukowitz, Milwaukee, Wisconsin

An ever-increasing number of shop teachers are finding the tin can a prolific source of free material for projects rich in educational possibilities. Work with the humble tin can has proved that elaborate and costly tool equipment is not required for creative work in metal.

Fig. 1. Candy dish

There is scarcely another medium which possesses the possibilities of the tin can in developing resourcefulness, initiative, thrift, artistic sense and appreciation. Woodworking teachers who desire to introduce metalwork into their courses will find the tin can an excellent source of material, and since the tools required are few and inexpensive, even strained school budgets will permit the introduction of this work.

To acquaint the reader with a few of the processes involved in constructing a typical project such as Figure 1, from tin cans the following description is given.

Figure 2, A, represents a block of wood on which all beaten projects of this type are formed. The depression in the end of the block is formed by hammering the block with the ball end of a ball-peen hammer. The depression in the block should be about 3/6 in. deep. A 6- to 12-ounce hammer is suitable for this work.

The top or bowl of this candy dish is made from the bottom of a 5-in. diameter coffee can. The bottom can be cut from the can with a can opener of the type shown at B, in Figure 2. This type of can opener will cut the bottom off right under the rolled rim and it will not leave any sharp edge protruding from the rim. Tin snips may be used to cut the bottom from a can. When using tin snips for this purpose follow exactly the procedure illustrated in *55 New Tin-Can Projects*.[1]

The actual forming of the can bottom is begun as shown at C, in Figure 2. Hold the can bottom flat on the block right over the depression in the block and begin hammering in the center as illustrated. Strike the metal lightly with overlapping hammer blows and never lift the hammer more than 1½ in. or 2 in. Heavy blows will tear holes through the tin. Continue hammering out from the center as shown by the arrows until the rim of the can bottom is reached. It will, of course, be necessary to shift the position of the can bottom over the block so that the part being hammered is over the depression in the block. Start hammering in the center again and gradually hammer around and around until the rim is reached again. When in the course of the hammering process it becomes necessary to tilt the bowl as shown at D in Figure 2, be sure to hold it at the same angle and over the same portion of the block as the hammer blows are applied. Repeat the hammering in this manner until a depth of 1 in. is obtained. After the shaping is finished the bowl may be given a much smoother finish by hammering it very lightly over a flat piece of wood. Use the ball end of the hammer for this purpose.

A Forming block about 2"x2" and 3 or 4 long
B Cutting the bottom off a can with can opener which leaves no sharp edges
Revolving cutter cuts off can bottom just below rolled rim
C Begin hammering in the center & move toward the rim with overlapping hammer blows
F First profile of base
E Finished profile of base
G Forming small raised section at center of base
J Punching hole in center
D Repeat the hammering process shown at C until the desired depth is reached. Tilt the work as necessary
H Soldering base to bowl through hole punched in base
K Making slight depression in top of base into which bowl will set

Fig. 2. Manipulative processes

The base of the candy dish is made from the bottom of a 2⅝-in. diameter can. The profile of the base is shown at E, in Figure 2. The first step in forming this profile is to beat the can bottom to the profile shown at F, Figure 2. This is done as shown at C, in Figure 2. Notice that the raising of the base does not extend to the rim of the base. The raising blends out from a flat section near the rim to the raised section at the center thus forming a beautiful compound curve. The small bead or second raised section at the very center of the base is formed after the compound curve just described is completed. This small raised section is formed as shown at G in Figure 2. Round off the inside edge of the pipe so that it will not cut the tin.

The base and bowl are soldered together as shown at H in Figure 2. Before soldering, a hole should be punched in the base as shown at J in Figure 2. A nail set from which the point has been ground off makes an excellent punch. It is through this hole that the two parts are soldered together as shown at H in Figure 2. After the hole is punched in the base, tap the base lightly as shown at K in Figure 2, so as to form a depression into which the bowl will set while being soldered. A noncorrosive soldering paste or soldering liquid should be used as a flux in soldering tin. The soldering iron should be held in contact with the work long enough to cause the solder to flow under the joint thus creating a good solid joint.

The project should be washed with water after soldering and then dried and polished with 3/0 steel wool. The metal will retain its fine luster for a long time. It may be repolished, but if the original brightness is to be retained it may be lacquered with clear lacquer. Waxing also will prevent tarnishing.

[1]The Bruce Publishing Co., Milwaukee, Wis.

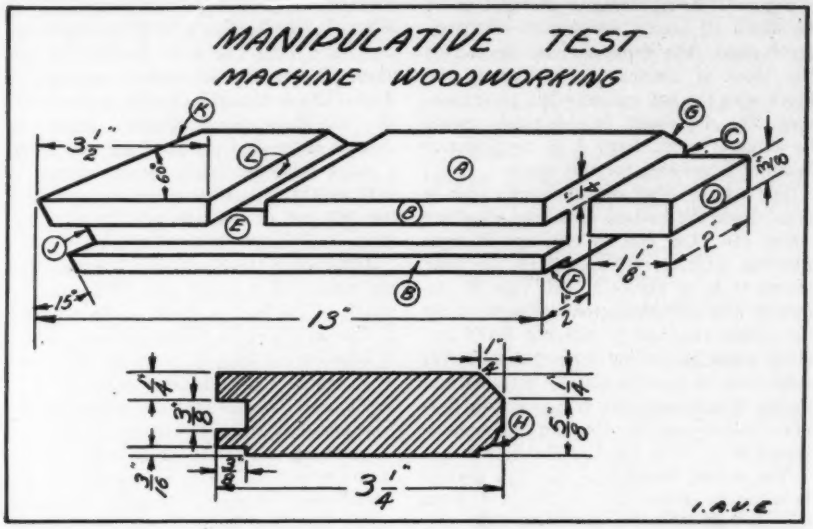
MANIPULATIVE TEST

Clifford L. Yard, Junior-Senior High School, Hastings-on-Hudson, New York

The manipulative test for machine woodworking presented herewith has proved very satisfactory. It may be given at midyear or toward the end of the school term.

I. *Directions*

This is a test to determine how accurately you can use power tools. Do this project as accurately as you can. Work only as fast as to produce your best work. The steps must be done in the order given. Perform only the tool operations asked for.



After you begin work do not ask unnecessary questions, but if you are in doubt about the steps in the procedure or a dimension on the drawing, ask the examiner.

II. *Procedure*

1. Select the best face and plane it smooth and true. When finished mark it A.
2. Plane the working edge B true and square with the working face A.
3. Rip edge C to width and square with the working face A.
4. Cross-cut end D square with A and B.
5. Rip-saw to thickness. *Do not plane.*
6. Saw groove E with dado head.
7. Plane rabbett E on the jointer.
8. Plane chamfer F on the jointer.
9. Cut ¼ or ⅜ in. corner head H with the shaper.
10. Cut the tenon to the given dimensions on the power saw.
11. Lay out and cut dado L, ¼ in. deep and ½ in. wide with the dado head on the power saw.
12. Lay out and saw end opposite tenon. Make angle at J, 15 deg. and K, 60 deg.

III. *Scoring*

Perfect measurements get a score of 10. An error of 1/32 in. is given a score of 9; 2/32, 8; 3/32, 7; 4/32, 6; 5/32, 5; 6/32, 4; 7/32, 3; 8/32, 2; 9/32, 1; 10 and more 32nds, 0.

The following scoring chart is convenient for recording the grading of the manipulative test:

Scoring Chart

Working face	
Working edge	
Thickness	
Width	
Length	
End D, squareness	
Tenon, length	
Tenon, thickness	
Tenon, shoulder cut	
Groove E, width	
Groove E, depth	
Rabbett, width	
Rabbett, depth	
Chamfer	
End cut G, 60 deg.	
End cut J, 75 deg.	
Corner bead	
Total score	
Final score = Total ÷ 2	

A TURNED MATCH BOX

William J. Becker, Junior High School, Ithaca, New York

It is difficult at times to engage the full interest of a boy in making something which he sees sold at a very low price. While many boys are interested in building or making, from the sole motivation of the joy in its making, many need jobs of an interesting nature to engage their attention fully. We always hope for interest for interest's sake but varying conditions make this impossible in most shops.

Because most boys have either camped, or fished, or because they belong to the Boy Scouts, the turned match box has attracted a maximum of attention and, besides, although not being too difficult, includes most of the elementary lathe processes.

Because steel is susceptible to rust, brass or aluminum should be used for this project.

The job sheet was designed to show the progress of the work by stages. When the student encounters operations which he has forgotten, he may refresh his memory by checking with the references listed.

Job Sheet

This job, the turned match box, involves many interesting lathe operations. It makes a very handy box to carry matches while camping.

Materials required: 1 piece of brass or aluminum, 1 in. in diameter by 5¼ in. long.

Directions

1. Cut stock to length and file off burrs. See Figure 1.
2. Set up work in lathe chuck, put lathe in slowest direct speed and square both ends. See reference 64 to 67.

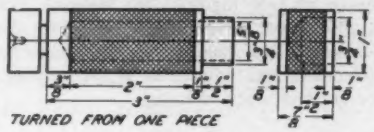


Fig. 1

3. Locate centers of stock; center punch and center drill as in Figure 2. See reference B, pages 36–40.
4. Mount work between lathe centers. Have instructor check work. See reference B, pages 42–43.

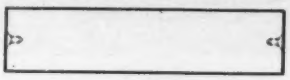


Fig. 2

5. Set turning tool in correct position. See reference B, page 28.
6. Turn down just enough to make exactly round.
7. Measure off knurled section for cap as in Figure 3 and knurl this part. Have

Fig. 3

instructor check. See reference B, page 52. Put lathe in slowest back-gear speed.

8. Put work in chuck. Drill with a ¾-in. drill to a depth of ½ in. as shown in

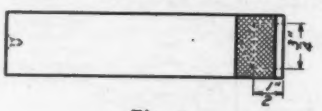


Fig. 4

Figure 4. See reference C, pages 76 and 81. Check with instructor.

9. Measure length of cap as in Figure 5. Set parting tool and cut off cap. See reference B, page 29.

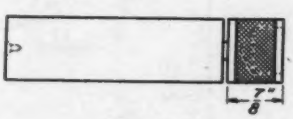


Fig. 5

10. Place cap in chuck and smooth end with facing tool. Be *careful* that the cap is not crushed by the jaws of the vise. Show work to instructor.
11. Relocate the center you have removed from the long piece. *Do this most carefully.*

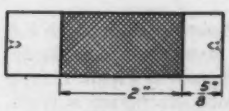


Fig. 6

12. Before drilling, try on lathe centers to see if piece turns true. Have setup checked by instructor.

13. Center-drill as in Operation No. 3.

14. Measure off portion to be knurled as in Figure 6 and knurl. See Operation No. 7.

15. Set up parting tool in tool post. Start end of shoulder to take cap as in Figure 7. Cut until calipers measures *exactly* ¾ in. See reference B, page 51.

Fig. 7

16. Put turning tool in tool post and turn shoulder to 49/64 in. See reference A, page 62; also Figure 8.

17. Put lathe in high speed. With mill file, cut down shoulder until the cap fits

Fig. 8

snugly. Test frequently to avoid cutting too small. See reference A, page 130.

18. Place work in chuck for drilling. Be sure to guard knurling from being damaged by chuck jaws. Wrap with a single layer of thin brass or copper. See instructor.

19. Mount drill chuck in tailstock and

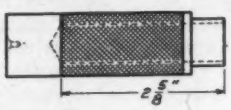


Fig. 9

place a 5/8-in. drill into the drill chuck. Run lathe slowly through back gears.

20. As in Figure 9, slowly drill to a depth of 2⅝ in. Remove drill frequently to get out waste metal. Oil at the same time. See reference C, pages 76 and 81.

21. Turn work around in chuck and with parting tool cut off end. See Figure 10.

22. Smooth end of work with facing tool.

23. Put lathe in high speed; polish cap and body, except on knurled section, with old emery cloth and oil. See reference C, page 60.

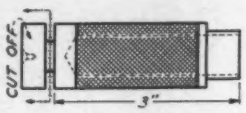


Fig. 10

24. Submit work to instructor for grading.

References

A. *Machine Shop Practice,* Jones, The Bruce Publishing Co., Milwaukee, Wis.

B. *How to Run a Lathe,* South Bend Lathe Works, 30th Edition.

C. *Metal Work,* Jones, The Bruce Publishing Company, Milwaukee, Wis.

MODERN RADIO BENCH

Lawrence Wolske, Menomonie, Wisconsin

The radio bench illustrated and described herewith is easy to make. It embodies such features as recessed top, flush rails, and tier brackets. It is a project that will look well with any of the modern radios.

Procedure: Select the kind of wood that is going to be used. Gumwood with a walnut finish makes up very well and is quite inexpensive.

Legs: Use 2-in. square rough stock. Cut legs 18½ in. long, which allows ¼ in. on each end for finishing. Square the legs to 1⅝ in. finish size. Mortise the legs, then taper them on the jointer. Begin the taper 2⅝ in. from the top, and taper to ⅞ in. square at the bottom.

Vein the legs with a veining tool or chisel at the places indicated. Be sure that the veins at the bottom ends of the legs are not so deep that they will make the bench structurally weak.

Rails: Use 1-in. rough stock and finish the end rails to 13/16 by 2 by 12¾ in.; side rails, 13/16 by 2 by 23¾ in. This allows 1⅜ in. on the ends of the rails for tenons.

If metal top fasteners are to be used to fasten the top to the rails use two on each side and one on each end. On the back of the rails mark with a marking gauge the height of the metal fastener from the top of the rails. With a ⅛-in. chisel cut in the back center of each end rail a hole ⅜ in. deep and as wide as the metal top fastener. On the side rails chisel similar holes 5 in. from each end.

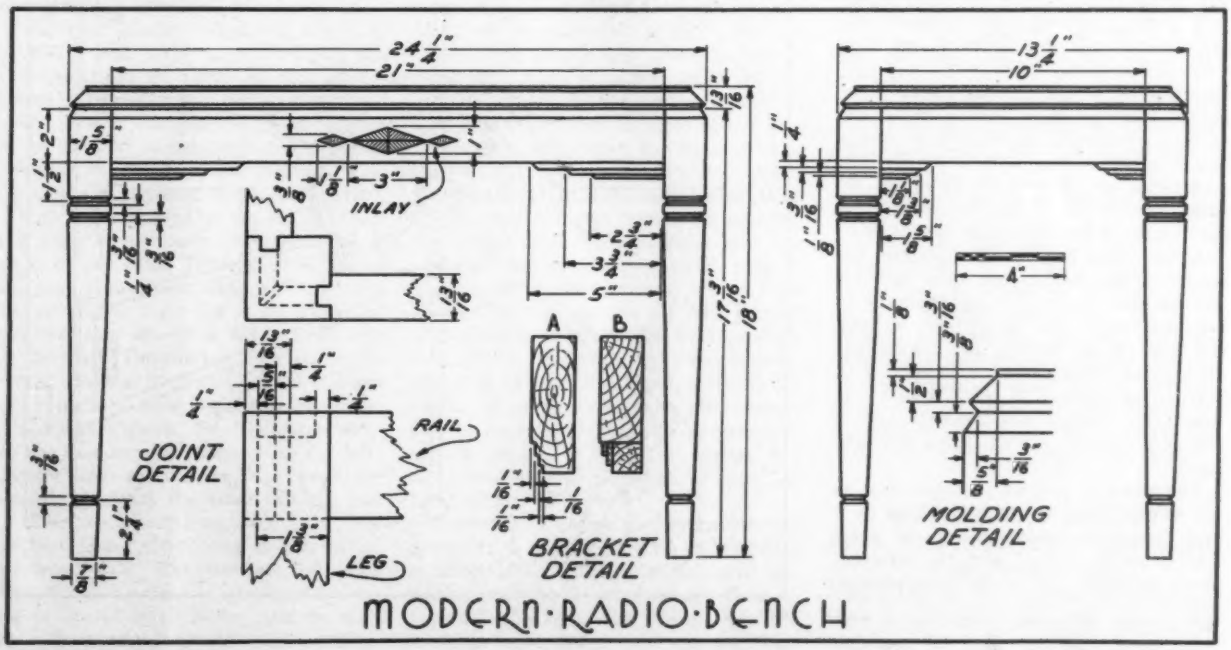
Inlay Side Rails: Make the center piece of four individual pieces with the grain lines radiating toward the center. A light wood should be used for the center piece. Make the end pieces of one individual piece of some wood that will offer contrast to the center piece.

Brackets: See bracket details on the drawing. The 1/16-in. setback in each tier of the bracket can be cut on the ripsaw. If this is done the bracket stock should be wider than ⅝ in. so that it can be more easily handled. The surplus can be cut off afterwards. Bevel the end of each tier with a chisel.

The brackets can be made of three separate pieces by gluing two 1/16-in. strips to a ⅝-in. strip. See bracket detail B.

Top: The dimensions for the top are 13¼ by 24¼ in. The top molding can be cut with a molding plane, or on a shaper.

To prevent the top from warping saw



kerfs should be cut 2 in. apart, 5/8 in. deep, up to within 2 in. of the two ends. The kerfs should be cut with the grain of the wood.

Assembly: Sandpaper the legs and rails before assembling. Glue the rails to the legs. Saw off the legs so that the bench stands squarely, and trim off the top of the legs to make them flush with the rails.

If the rails have already been chamfered at the top, chamfer the legs likewise; if not, both legs and rails can be chamfered at once either on the jointer or with a jackplane.

Smooth the top and fasten to the rails. It can either be fastened with metal top fasteners, or with screws.

Finish: If gumwood has been used for the body of the project apply the following finish.

A. 1. Prepare the surface.
2. Stain, walnut oil stain. Dry 24 hours.
3. Shellac with a one-pound cut of shellac. Allow to dry.
4. Remove irregularities with steel wool No. 0. Clean surface with a cloth.
5. Shellac with a two-pound cut of shellac.
6. Wax. Polish.
7. Wax. Polish.
8. Wax. Polish.

B. The veining and brackets should be finished with a black enamel.

C. The inlay should get the same finish as the body of the bench except that it should not be stained.

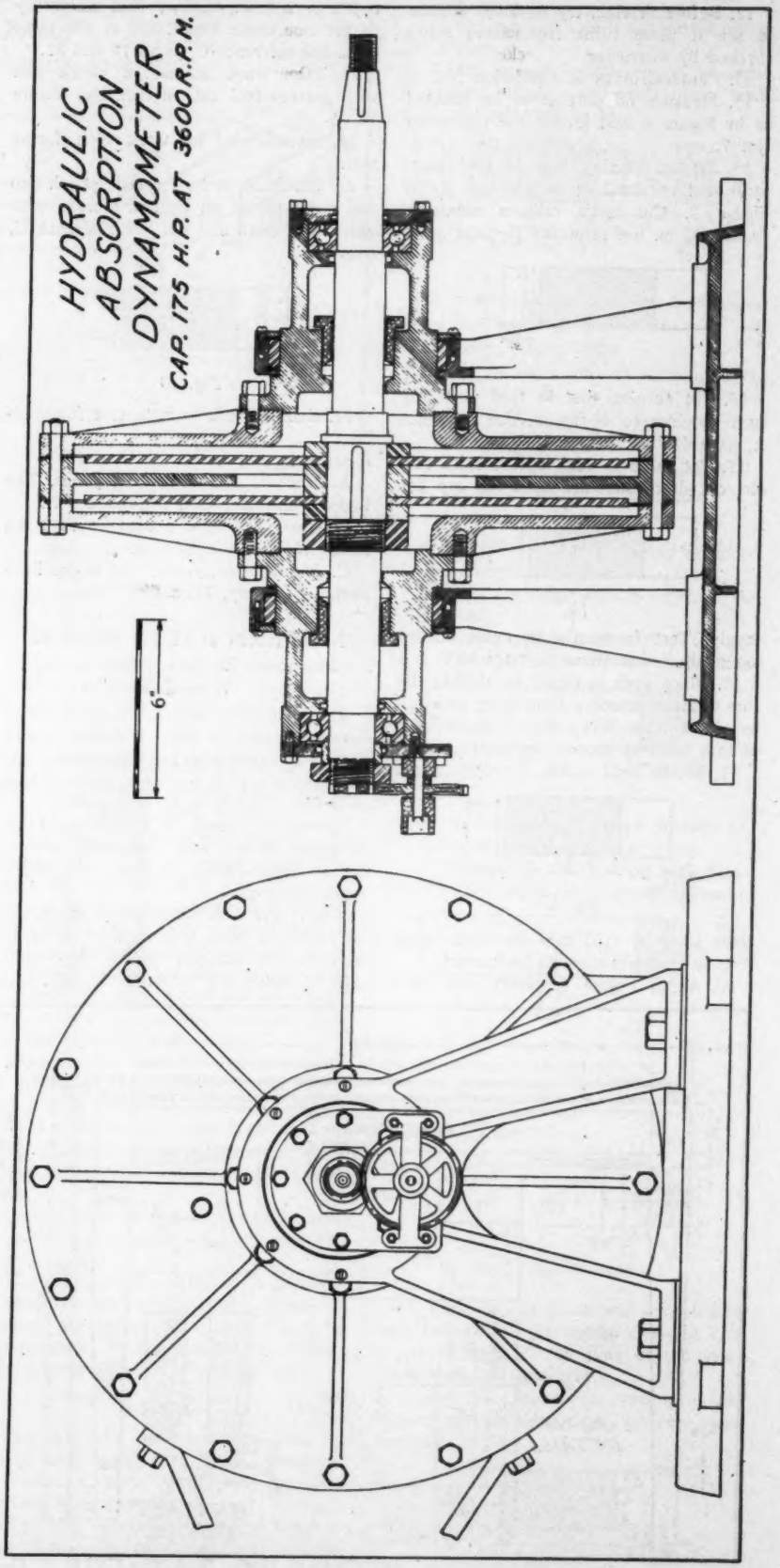
A HYDRAULIC ABSORPTION DYNAMOMETER

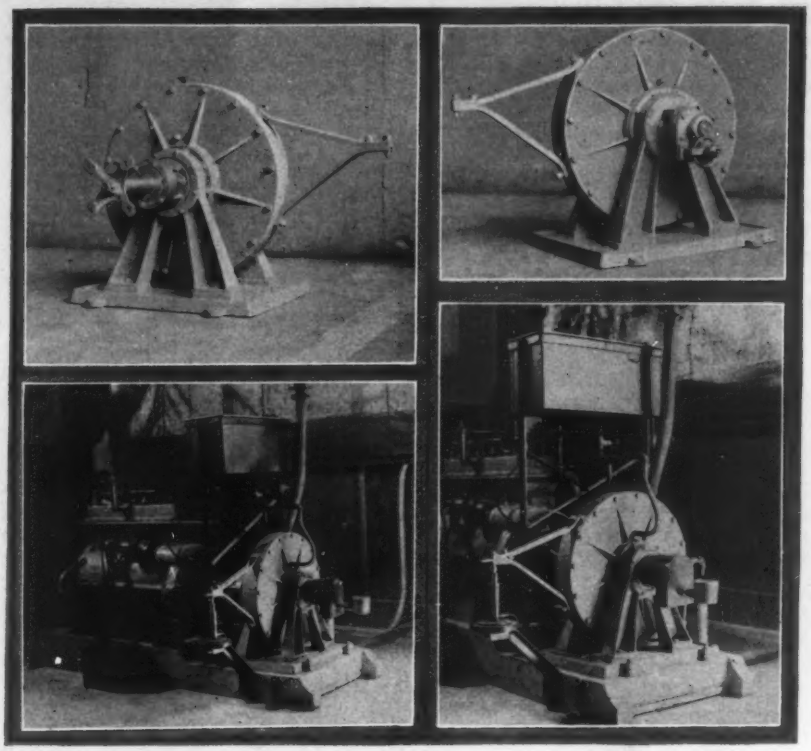
M. D. Taylor, High School, Stockton, California

Most people think that a dynamometer is a complicated piece of mechanism, but such is not the case. The hydraulic absorption dynamometer described and illustrated herewith was made completely, with the exception of the castings, in the shops of the Stockton High School. While the design is principally the writer's, he wishes to give credit to Mr. E. L. Pister for help in working out some of the details of the design, and to Mr. J. H. Harrison for his supervision of the machining operations.

As the name implies, the hydraulic absorption dynamometer uses water both for creating the friction or load necessary to hold an engine, and to absorb the heat generated by the friction. This means that a supply of cooling water at constant head must be supplied at all times. Unless this supply is constant and adequate, steam will be generated, and unloading will take place.

The principle involved is simple. Just as the water follows the hull of a boat as it slips through the water, so does the water that comes in contact with the revolving plates inside the case of the dynamometer.





The hydraulic dynamometer

One may not think that the water will offer much resistance to the ¼-in. steel plate. It really does not at slow speeds, but when the speed is increased to three miles per minute, the friction is great enough to cause the water to boil in just a few minutes. The centrifugal action of the plates tends to build up a ring of water around the outer edge of the plates, increasing the pressure and also the friction. The wider this ring of water, the more horsepower is absorbed.

The dynamometer shown will absorb up to 100 h.p. at 3000 r.p.m. However, the capacity drops to about 30 h.p. at 200 r.p.m. In general, the capacity varies about as the cube of the speed. A slight increase in the diameter of the plates makes a large difference in the absorption capacity, varying as the fifth power of the diameters.

With the exception of the shaft, plates, and a few small pieces, the entire unit is made of cast iron. The two 18-in. plates are just plain rolled steel, and are used just as rolled. Balancing is hardly necessary, but they should be flat and run true on the shaft. The shaft is large enough to permit making it of mild steel, though better material would probably be advisable at higher speeds. The five pieces forming the case and the supports for the self-aligning ball bearings must be machined parallel, otherwise the shaft will not line up. The two brackets supporting the case are best bored after being assembled on the base plate. The size of the holes through the brackets is governed by the size of the 44 small rollers used on each side. These may be cold-rolled steel or drill rod. When assembled the weight of the torque arm should be sufficient to rotate the case, yet the fit on the rollers should be close enough to prevent vertical movement.

The drawings call for glands around the shaft. These may be left off or just lightly packed, for there will be no leakage unless the case is filled too full. The torque arm may be any convenient length, but calculations are reduced to a minimum when it is 21 in. from the center of the shaft to the point of contact with the scale. With this length, every pound on the scale is 1 h.p. at 3000 r.p.m. or 2/3 h.p. at 2000 r.p.m. With a spring balance or springless scale, very accurate results may be obtained, the output is very smooth so readings are easily taken. The tachometer is driven by gears at one-half engine speed. A belt would be much quieter and probably just as accurate. An equalizing tank for water is used in our setup which helps in keeping the speed uniform. Water from the service pipes goes to the tank through a common float valve. The tank is about 1 ft. above the case of the dynamometer. The tank also serves to supply water to the engine. A suitable coupling to the engine may be provided so that the dynamometer may be used on a variety of engines. We use a double fabric disk with no provision for a change of engines.

In testing an engine for horsepower, the procedure is as follows: With engine idling at about 1000 r.p.m., open the valve, admitting water to the case, enough to let in a good supply of cooling water. Open the discharge valve just a small amount. Soon the tachometer will show a decrease in speed, gradually open the engine throttle until it is wide open. If the speed is too slow, open the discharge valve a little. If too fast, open the inlet valve a little more, or, if there is a good flow of water through the case, the discharge valve may be closed a little. The regulation of the speed can best be accomplished by means of the discharge valve, making sure that sufficient water is flowing to keep things cool. It takes between four and five gallons a minute with the engine producing 75 h.p. If the test is for a certain speed, then take the scale reading at that speed. Multiplying the speed by the scale reading and dividing by 3000 if a 21-in. torque arm is used, gives the h.p. being developed. By taking a series of readings at different speeds, the peak of the horse-power curve is easily found. If the peak of the torque curve is desired, slow the engine down by closing the discharge valve slightly. Watch the scale and when this reaches the highest point, read the tachometer. This scale reading multiplied by the length of the torque arm in *feet* is the torque in foot-pounds for that engine speed.

For instruction purposes we have installed a mercury-column vacuum gauge for the intake manifold and a mercury filled "U" tube gauge for the exhaust manifold to register the back pressure. We use a six-cylinder 3⅛ by 4¾-in. engine belonging to the vintage of 1926. An angle stem thermometer is inserted directly into the cylinder-head water jacket for water temperature. A mercury well has been built on the side of the crankcase and a immersion-type thermometer gives the oil temperature during the test. This engine has produced 67 h.p. at 3000 r.p.m.

The following are the general dimensions: Base, 18 by 21 in.; height to shaft center, 12½ in., diameter of plates, 21 in.; thickness of plates, ¼ in.; shaft length, 26 in.; shaft diameter at center, 2 in.; shaft bearings, number 2308 S.K.F. self-aligning.

The design was worked out using Unwin's formula for power absorbed by disks rotating in water, which is as follows:

$$h.p. = \frac{623\ f\ N^3 R^5}{550} \text{ for one disk}$$

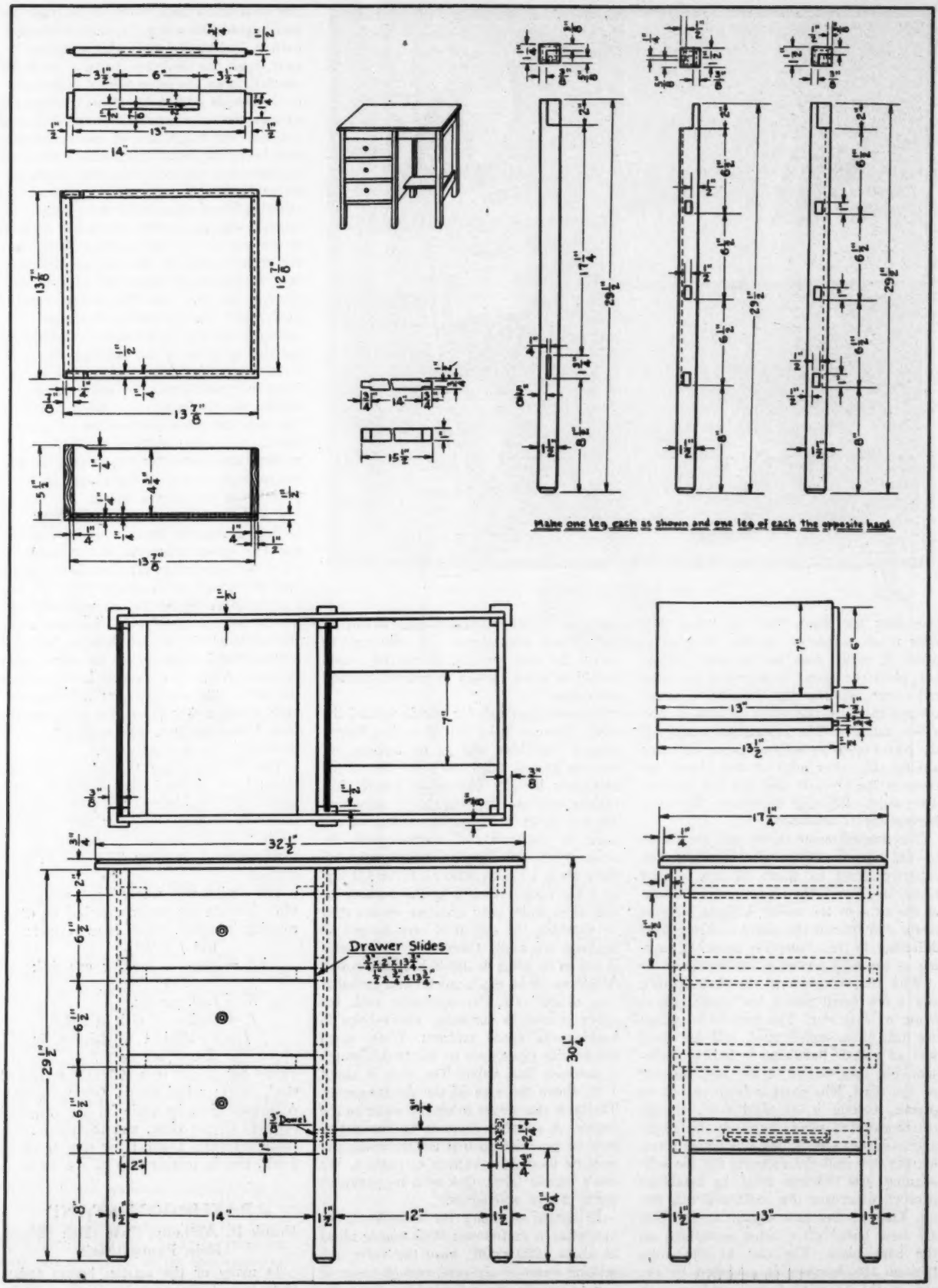
N = Rev. per sec.
R = Radius of disk in feet
f = Co-efficient of friction in pounds per sq. ft.

Values for f; cast iron, .002129; machined steel, .0021; rolled plates, .00215 (about). Allowance must be made for the unwetted surfaces of the plate, and frictional resistance decreases about 1 per cent for each 5-deg. rise in temperature of the water.

BATHROOM STAND

Frank E. Anthony, East High School, Erie, Pennsylvania

In many of the smaller homes today, there is no built-in cabinet for linen in the bathroom. In nearly all bathrooms, how-



Bathroom stand

ever, there is space to accommodate a table such as the one described herewith. It may be necessary to change the dimensions slightly to fit the bathroom for which it is to be built, but the dimensions shown in

PCS.	SIZE	MATERIAL	NAME OF PART
6	1½"×1½"×29½"	PINE	LEGS
1	¾"×7"×13½"	"	SHELF
1	¾"×17"×32½"	"	TOP
6	¾"×1"×15½"	"	DRAWER RAILS
2	¾"×2"×29¾"	"	APRONS
1	¾"×2"×14¼"	"	APRONS
6	1"×2"×13¾"	"	DRAWER SLIDES
6	1"×3"×13¾"	"	DRAWER SLIDES
3	⅞"×5½"×13⅜	"	DRAWER FRONT
6	½"×5½"×13⅜	"	DRAWER SIDE
3	½"×5¼"×12⅞"	"	DRAWER BACK
3	¾"×2¼"×14"	"	LOWER RAIL
3	¼"×13"×13⅜	PLYWOOD	DRAWER BOTTOM
2	¼"×13½"×21½"	"	END PANELS

Bill of material for bathroom stand

the drawings give a piece of furniture of pleasing appearance. Details of construction also may be altered to suit the type of students being instructed. For instance, in classes of advanced woodwork it might be advisable to use a dovetail construction on the drawers or with classes of less ability to employ a glue-block construction. The chamfer on the bottom of the legs is used to prevent the sides from splintering when the table is slid along the floor. If metal slides are used, the chamfer may be omitted. To make the drawers slide freely, push a ½-in. solid-head thumb tack into the slides about ¼ in. back from the front so that the drawer slides on the tack head instead of on wood. The back panel which is omitted in the material list may be used when making the table.

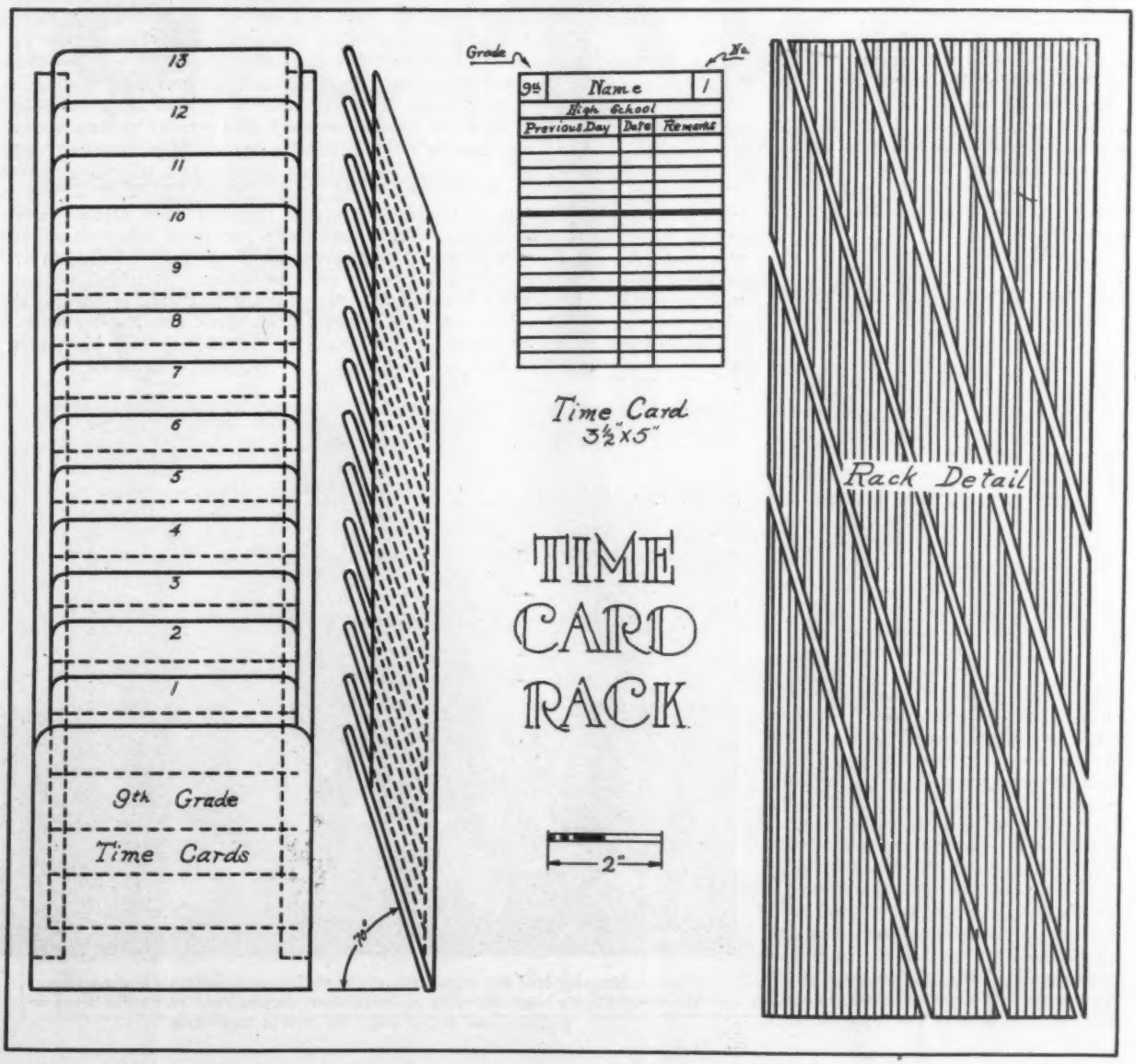
TIME-CARD AND RECORD-CARD RACK

Arthur K. Stinson, St. Louis, Michigan

The increasing number of students in school shops has made record-keeping a serious problem. The *time-card* idea here described is a device whereby the instructor may follow the work of each boy every shop period, throughout the school year, in a minimum of time, and without much bookkeeping.

Every boy has a time card, such as is shown in the illustration. As he passes into the shop, his card is taken from the rack. He then writes on it his *previous day's* accomplishment. Any cards left in the rack give an immediate check on the absence for that particular period, this being recorded on the remaining cards.

The daily report made by each student shows the individual progress, and with the instructor's notes in the column under *remarks*, a complete record is made. The date for starting and finishing projects, plus the grade and cost also may be recorded. Misdemeanors and disorderliness, as well as application or effort, may be noted on the card. If a boy works on an outside project, credit may be given him. Comment regarding the foreman, toolroom



man, or safety superintendent may also be jotted down, as well as any remark concerning the boy's work. This method of checking students is not only beneficial to the instructor, but is an interest factor of no little importance, as each boy, thereby, has a tangible account of his daily work.

The device takes a surprisingly small amount of the instructor's time and even this factor is offset by the student's response in making a conscientious effort to keep his daily record a perfect one.

The cards are so designed that three weeks' progress may be kept on each side, giving a complete record of the six weeks' marking period. The cards may then be filed away for a record of any duration.

Time-Card Rack

The rack in which the cards are held is constructed by ripping grooves to 3/16 in. deep, ⅛ in. apart, across the face of two pieces of stock ½ in. thick. The two pieces of stock are necessary to form the right and left side of the rack.

Width and length of the boards is determined by the number of cards necessary for the boys in the largest class. The grooves should be cut by a saw blade having ⅛-in. thickness to permit the use of ⅛-in. plywood partitions. After ripping the parallel grooves, the stock is then cut in 1⅛-in. strips across the diagonal, as shown. The shorter strips being used for smaller classes.

THE MOCKING BIRD ASH TRAY

Murray V. Churchill, Pittsburgh, Pennsylvania

The mocking bird is noted for his song. It is the state bird of Tennessee. This ash tray is a monument to him in cast aluminum and represents him perched on a weathervane. The work is executed in low relief, which means that a certain amount of perspective is retained, but that the depth or thickness is on a smaller scale than is the length and width.

It is perhaps not strictly accurate to say the tray is made of cast aluminum, for pure aluminum is hardly ever cast. In reality, an aluminum alloy is used, such as No. 12, which contains 8 per cent copper and 92 per cent commercially pure aluminum.

Begin by making the pattern. This may be carved out of wood. On a ½-in. pine board, draw the outline of the bird sitting on the spherical finial surmounting a weathervane, as he is shown in the background of Figure 1. Saw out on a jigsaw, leaving a substantial thickness of wood connecting the bird to the weathervane. With a sharp wood chisel, round off the bird's body and head and trim down the tail feathers and wings. For a deep, gouging cut, hold the bevel up, for a flat, paring cut, hold the bevel down. To give an appearance of depth, tilt the plane of the tail feathers slightly from front to back. Next, cut the slope of the front and back of the square base just as the sides were tapered with the saw. Around the top of the base leave a slightly projecting border about 1/16 in. wide. Carve out the details of the two direction arrows which carry the letters. Make the shafts about ⅛ in. thick as viewed from the front and 3/16 in. thick viewed from the top. Make the arrowheads and letters stand out by making them ¼ in. thick. Then carve out the ball on which the bird is perched and also his legs and feet. This portion is done last to avoid splitting. In low relief, the 1-in. sphere will be what mathematicians call an oblate spheroid with a minor diameter of ½ in. and a major diameter of 1 in. The practical man, however, might call it a pill or a knob. Shellac the pattern well, all over, and allow it to dry thoroughly.

The birds may be cast separately or in pairs. Figure 1 shows the birds cast in pairs and the method by which they were gated for casting. A thin runner about 1 in. wide connects the backs of two birds. From the center of this runner, a second runner, leading to the sprue, is cut at right angles. It should be slightly thicker toward the sprue but should taper to the thickness of the connecting runner at the point where the two runners join. To feed the castings, a riser is placed at the junction of the two runners and a blind riser out from the end of the tapered base.

The pattern for the tray can be turned from wood. The tray is 6 in. in diameter and ⅞ in. high. The metal is ⅛ in. thick near the edges, but near the center it is somewhat less, for on the underside a circular area 4½ in. in diameter is recessed slightly to permit the tray to rest more solidly. In the center of the upper side is a ¾-in. circular boss, the sides of which meets the tray surface in a fillet. The top surface of the boss is level with the edges of the tray. The gating is clearly shown. At the point where the runners enter the tray, they are somewhat thinner in order to produce a choke effect.

During casting, pour the metal at the lowest temperature at which it will completely fill the mold; in this case, about 1,250 deg. F. The casting should be poured in a steady stream and with the pouring ladle as near the top of the sprue as possible. High pouring temperatures and sloppy pouring may cause defective castings. Melting is also important and the metal should not be heated any higher than necessary to secure the proper pouring temperature when it reaches the mold.

After knocking the casting out of the sand, saw off the risers and finish by grinding or filing off the small parts of the risers and runners which remain on the castings. Drill a 7/32-in. hole through the axis of the boss of the tray and countersink it on the underside. Polish the tray casting inside and out first on glued rag or canvas wheel on which glue has been painted and No. 60 emery applied, then on a felt wheel faced with No. 160 emery, and finally on a buffing wheel to which a tripoli compound or similar buffing abrasive has been applied. During the first operation (roughing) keep the piece smeared with tallow and during the second (oiling), lubricate it with a heavy oil. Peripheral wheel speeds of about 6,000 f.p.m. are about right for roughing and oiling while about 7,000 to 7,500 f.p.m. is good for buffing.

There are several ways of finishing the bird and his perch. One pleasing finish is given by sandblasting and highlighting.

(Continued on page 292)

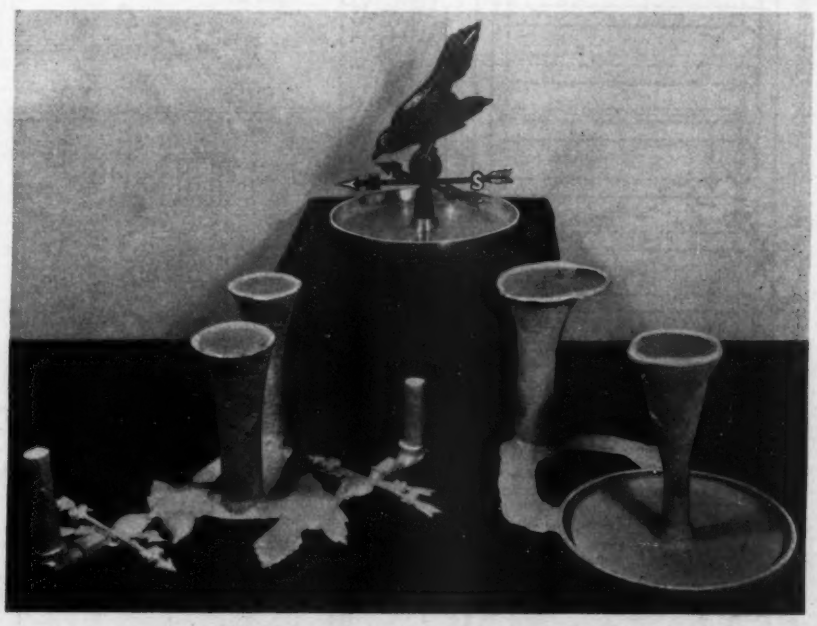
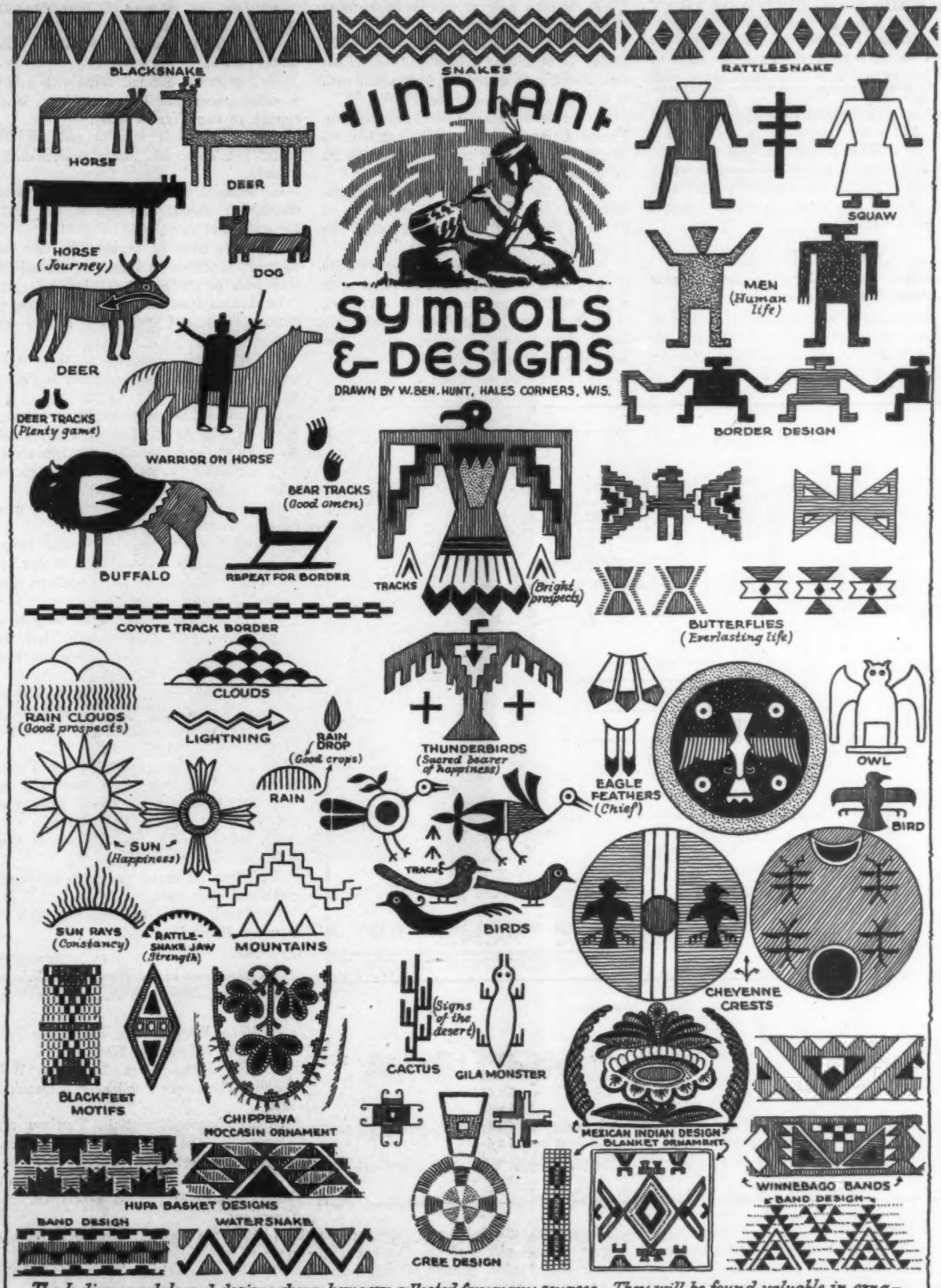


Fig. 1. Mocking-bird ash tray. At left, the birds cast in pairs, before trimming. At right, the tray as cast with risers. Center, the finished tray. The bowl is polished and buffed while the bird is sandblasted



The Indian symbols and designs shown here were collected from many sources. They will be found valuable in ornamenting such articles as moccasins, headbands, vests, knife sheaths, tepees, war drums, tom-toms and the like.

THE MOCKING BIRD ASH TRAY

(Continued from page 290)

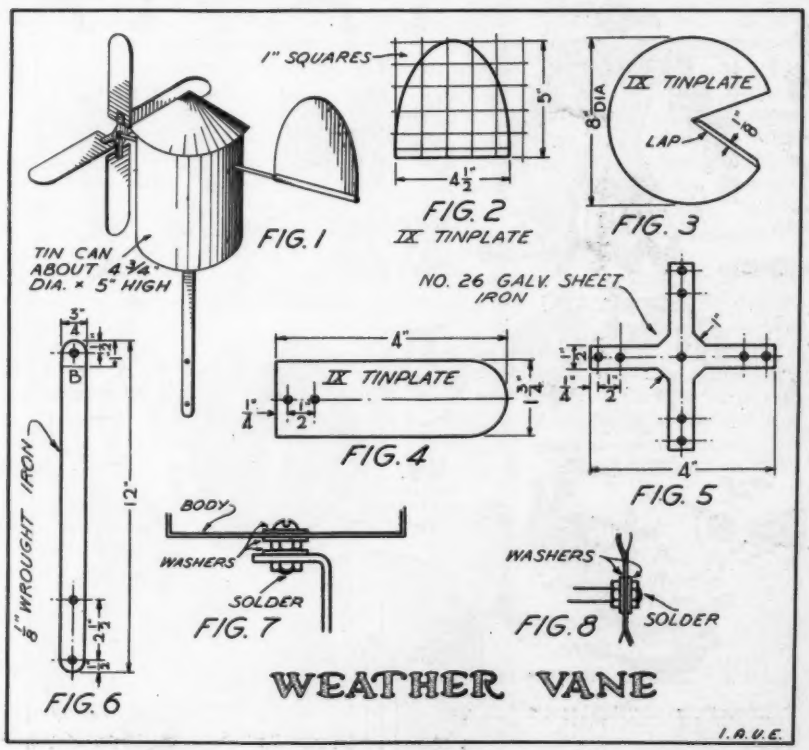
Highlighting the body of the bird can be done on the buffing wheel but the faces of the letters will have to be highlighted with a small flat mill file.

Grind the bottom of the standard flat and drill a hole about ⅜ in. deep with a No. 26 drill. Tap out this hole to receive a 10—24 flat-headed machine screw which is used to fasten the standard to the tray. The finished tray is seen in the background of the illustration.

WEATHER VANE

William J. Becker, Boyton Junior High School, Ithaca, New York

This weather vane utilizes for its main cylinder a discarded tin can. Many other useful articles can be made from tin cans, which otherwise would be wasted.



Bill of Material

Part No.	No. Required	Name	Material	Size
1	1	Body	Discarded tin can	About 4¾ in. diam. by 5 in. long
2	1	Fin	IX Tin plate	5 x 4½
3	1	Roof	IX Tin plate	8 x 8
4	4	Propellers	IX Tin plate	4 x 1¾
5	1	Propeller support	No. 26 galvanized sheet iron	4 x 4
6	1	Shaft	No. 5 wire	14
7	1	Mounting	Wrought iron	¾ x ⅛ x 12

Directions:

1. Write out a bill of material and have it approved by the instructor.

2. For the body, procure a tin can of the required size and locate the center of its bottom. Check with the instructor.

3. Punch a hole at this location, using a solid punch with a 3/16-in. face.

4. Mark the locations where the shaft passes through the cylinder, 1 in. below top; *check with instructor* and punch with a 3/16-in. solid punch. See Figure 1.

5. Scribe the outline of the fin pattern, Figure 2, on a piece of tin, and cut to shape with a pair of tin snips. Smooth off all burrs.

6. Set the bar folder for wire of the size used for the shaft. With setting at ¼ in., turn open fold along bottom edge. See Figure 2.

7. Scribe outline of roof pattern, Figure 3, on a piece of tin and cut to shape with a pair of tin snips. Smooth off all burrs.

8. Form roof into shape of cone by hand, using stake of proper shape. The hem should overlap ⅛ in. for soldering.

9. Solder roof along hem.

10. Scribe outline of propeller pattern, Figure 4, on 4 pieces of tin. Cut out with a pair of tin snips. Smooth off any burrs.

11. Locate holes as shown in Figure 4 and punch with a No. 9 solid punch.

12. Scribe outline of propeller-support pattern and cut out with tin snips. Smooth off burrs. See Figure 5.

13. Locate all holes in Figure 5 and center-punch.

14. Punch the 8 small holes with a No. 9 solid punch. Drill center hole large enough to turn free in shaft.

15. Cut piece of wire or rod for the shaft. File ends flat. Make shaft exactly straight.

16. Using a 10–24 die (check size with instructor), thread one end of the shaft for a distance of ½ in.

17. Cut a piece of wrought iron for the support, as shown in Figure 6. Round off both ends on the power grinder.

18. Locate holes as shown in Figure 6. Center-punch and drill with a 3/16-in. drill.

19. Bend end of support at B at right angles to main portion, as shown in Figure 6.

20. Look up the information on tinner's rivets on page 62 of *Metalwork Essentials* by Tustison and Kranzusch. Use 1-lb. rivets on the weather vane. Tell the instructor what you know about tinners' rivets.

21. Rivet the four propellers to the propeller support.

22. Bend the propeller mounting below each propeller at an angle of 45 deg. so the wind will catch the propellers. See Figure 1; also shop model.

23. Assemble mounting to the body as in Figure 7. After making certain that the body turns freely, cut bolt below last nut, smooth with file, and solder.

24. As in Figure 1, fasten fin to end of shaft with wiring machine. Solder fast.

25. Slip shaft through body, center the fin, and solder shaft to body.

26. Assemble the propeller as in Figure 8. Solder back nut first, then slip on washers and propeller. Adjust front nut, cut off surplus stock, and solder.

27. Solder roof to top of body in 4 or 6 places.

28. Clean off entire project with emery cloth and steel wool.

29. Check colors for enameling with instructor. Enamel.

References

1. *School and Home Work Shop*, Schultz and Schultz, Allyn and Bacon, New York City.

2. *Metal Work*, Jones, The Bruce Publishing Co., Milwaukee, Wis.

3. *Cold Metal Work Notebook*, Willoughby, The Bruce Publishing, Milwaukee, Wis.

4. *Metalwork Essentials*, Tustison and Kranzusch, The Bruce Publishing Company, Milwaukee, Wis.

5. *Essentials of Metal Work*, Berg and Wing, Manual Arts Press, Peoria, Ill.

Questions

1. How are files classified? Reference 4, page 87.

2. Give the method of drawing iron wire. Reference 2, page 14.

3. This project utilizes one of the millions of tin cans wasted every year. Sug-

gest some remedy to relieve this waste.

4. Why is copper used for a soldering bit? Reference 2, page 66, and reference 4, page 17.

5. Give three evidences of a tidy worker.

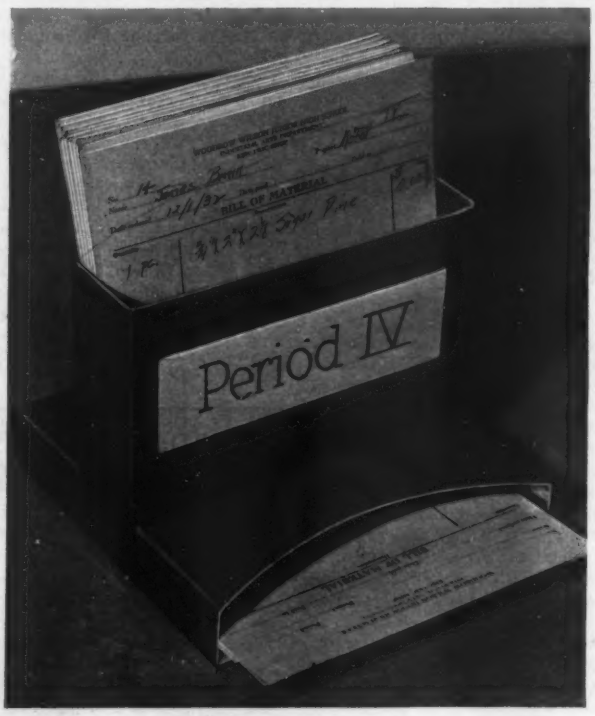
FILE BOX

Byron M. Taylor, Woodrow Wilson Junior High School, San Diego, California

School and home shops will find the filing box described herewith a great aid in filing bills of material, time cards, and the like. For the school shop, one box is constructed for each class period and each box is painted a different color, thus insuring recognition by the students. For the home, this file box may be used to hold recipes, formula, or clippings, while in the commercial shops it may be used for holding time cards, work cards, bills of material, and the like.

The box possesses the advantage that the upper member holds the cards that are in use while the blanks are kept in the lower member which acts also as a sturdy base for the entire structure.

Obviously, no dimensions can be given as they will depend upon the use to which the file box is put. Make the width of the box slightly larger than that of the cards. The depth of the upper member should be about two thirds the length of the card while the lower member is deep enough to enclose the card completely.



Answers to Questions

VENEERING WALNUT ON CEDAR

1000. Q.: Please advise what precautions are necessary in veneering walnut on cedar. In the case of a walnut veneered cedar chest, is the core cedar, face veneer walnut and veneer backing of cedar? If this is true, where is it possible to purchase 1/28-in. cedar for backing? — *W. F. W.*

A.: It is not practical for you to attempt to veneer cedar with walnut. In the first place, red cedar cannot be successfully cut 1/28-in. because of the knots; secondly, such a liner would be worthless for a chest because the wood quickly loses its essential oil. My recommendations would be for you to purchase 5/16- or 7/16-in. plywood with a figured-walnut face veneer, make up the chest completely and then line it with slip panels of solid cedar held in place with suitable quarter-round or other profiled moldings as your layout may call for. Stock for these panels may be resawed from 1-in. stock and the two inside faces, matched face out, to give a balanced figure which can then be used attractively in the various panels exposed to view. After assembly do not apply any finish to the inside liner, in order that a fresh surface may be exposed yearly by a light sanding, thereby renewing the odor of the fresh wood.

Supply houses advertising in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine can furnish you with all the necessary materials. — *Ralph G. Waring.*

FOR YOUR BULLETIN BOARD

POSTER 73 **SEPTEMBER, 1936**

AMBITION

There are new and unexplored fields open to the ones who have ambition to push themselves above the level of average achievement. Those who have ambition can look forward to life on a higher level than those who merely seek to get by.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

FINISHING PINE WAINSCOTING

1001. Q.: Please advise me as to the most desirable finish for new white-pine wainscoting. — *H. A. B.*

A.: The pine wainscoting should be finished a warm, soft yellow brown, similar to the shade which this wood tends to develop under varnish in time. Perhaps the best thing will be to use one or two tablespoonfuls of asphaltum varnish (turpentine grade) in a quart of gasoline. Try this on a piece of freshly sanded wood, let dry and then coat with shellac made from orange 1 part, white 1 part, and denatured alcohol 5 parts. Apply with a wide soft-bristle brush, such as a fitch or bear, without any excess brushing in order to avoid lapping the strokes. Let dry and sand smooth with a 6/0 garnet paper. Dust off and apply a well-brushed-out coat of flatting varnish. Let dry hard, sand with worn out 6/0 paper enough to make glass-smooth, and then oil with white mineral oil or Nujol. Wipe dry. This final finish should be glass-smooth; semi-dull; and very thin, apparently a part of the wood itself as colored by time. Contrary to advice which others will no doubt give you, do not use wax, as this will in time tend to produce a dirty effect. — *Ralph G. Waring.*

Personal News

¶ Mr. Paul H. Nystrom, formerly of Columbia University, New York City, has been appointed as a member of the Federal Board for Vocational Education. The appointment is for three years.

Mr. Nystrom, a native of Maiden Rock, Wis., is an authority on retailing and business management, and received the Ph.D. degree from the University of Wisconsin in 1914. Mr. Nystrom will represent manufacturing and commercial interests.

¶ Mr. Samuel G. Conner, formerly of Media, Pa., has taken up his new work as director of apprentice training for the Pennsylvania Department of Public Instruction.

Mr. Conner completed a course in the scientific department of the Coatesville High School, and later entered the Williamson Trade School, where he was graduated in 1919 after completing a course in patternmaking. Ten years later he was graduated with the bachelor of science degree in industrial education from the Pennsylvania State College. He has pursued graduate studies at the University of Pennsylvania, the University of Pittsburgh, and the University of Akron.

From 1915 to 1929, Mr. Conner gained wide experience as mechanic, engine designer, educational co-ordinator, and draftsman with the Baldwin Locomotive Works in Philadelphia, the Lukens Steel Company, and the Delaware County Supply Company. He has also had considerable experience in public-school work, as a teacher, director of vocational education, and as an apprenticeship-training co-ordinator for the Ohio State Board of Vocational Education.

¶ Dr. Walter B. Jones, of Allegheny County, Pa., has been appointed chief of the industrial-education division of the Pennsylvania Department of Public Instruction. Dr. Jones received his training at Carnegie Institute of Technology in Pittsburgh, at the University of Pittsburgh, and at Columbia University. He was given the doctor's degree by Columbia University in 1926.

Dr. Jones has had wide experience in the field of education. He was formerly a journeyman in the metal trades, served as instructor in industrial arts and continuation schools in Pittsburgh and Milwaukee, and was an instructor in the works management department of the Carnegie Institute of Technology. While at the University of Pittsburgh, he served as head of the Department of Higher Education, director of the Bureau of Educational Records and Research, and professor of industrial education. Previous to accepting his present position, Dr. Jones served as consultant in the Division of Personnel Examinations.

¶ Mr. James F. Barker, formerly assistant superintendent in charge of vocational education in Rochester, N. Y., for the past seventeen years, will retire from the position on September 1. Mr. Barker, who had been an educator for forty years, was a former president of Mechanics Institute, and a man who combined theoretical and practical knowledge and injected both into school vocational work.

Following his graduation from schools of mechanical engineering and architecture of Cornell University, and with practical experience in the latter field, he began his career in the manual-training department of the Milwaukee, Wis., schools in 1897. Later he became director of manual training in Grand Rapids, and director of the Hackley Manual Training School in Muskegon, Mich. In 1906, he went to Cleveland, and in 1907 he became the first principal of the East Technical High School of that city. A few years later he went to Rochester as president of Mechanics Institute, and after three years was appointed director of vocational work for the Rochester public schools.

¶ Mr. Verne A. Bird will succeed Mr. James F. Barker as assistant superintendent in charge of vocational education in Rochester, N. Y. Mr. Bird is a recognized authority in vocational education. He is a graduate of Cornell College in Iowa, holds a master's degree from the University of Rochester, and has completed the work for the doctor's degree at New York University. He was formerly principal of the Edison Technical and Industrial High School of Rochester, director of industrial arts in Rochester, assistant superintendent of schools in Utica, and director of education at Mooseheart Institute, in Mooseheart, Ill.

Association News

INDUSTRIAL-ARTS TEACHERS HOLD SECTIONAL MEETING AT PORTLAND

The industrial-arts teachers held their sectional meeting as a group in connection with the summer meeting of the National Education Association, in Portland, Oregon, June 30 to July 1, 1936. They not only had sectional meetings but their complete program

(Continued on page 14A)

FOR YOUR BULLETIN BOARD

POSTER 74 **SEPTEMBER, 1936**

CONFIDENCE

Confidence is gained by relying on one's own ability and confirming the decisions made by trial. Your confidence in your shopwork must be built up by attacking new problems and continuing them to a successful end.

© Industrial Arts and Vocational Education

Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

ADVERTISING PAGES REMOVED

the entering student who does not know that the number of instruments and *not* the number of "pieces" in a set determine its value.

It has long been the custom for honest manufacturers and honest dealers to refer *only* to major instruments such as ruling pens, bow instruments, dividers, compasses, etc., when stating the number of "instruments" in a set. When the various parts of a compass are counted as separate "pieces" and such standard accessories as keys, lead boxes, screwdrivers, etc., are counted to arrive at an impressive number, it is certain proof that the set is no "bargain." A real bargain can be sold without misrepresentation.

Dietzgen publishes this warning and urges instructors to warn their students in an effort to stop this malpractice. Counting "pieces" in a drawing set opens the way for unscrupulous suppliers to add worthless gadgets and eliminate essential instruments.

A drawing set is a long term investment. Its true value is determined by what you get for your money, not by how little you pay. On this basis a genuine Dietzgen Drawing Set is a real bargain . . . a super bargain.

EUGENE DIETZGEN CO.

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DIETZGEN

World Famous Quality

DRAFTING INSTRUMENTS

Dietzgen Drawing Instruments are manufactured in a wide array of styles, grades and assortments to meet the purse and service needs of everyone from the beginner to the professional draftsman and scientist. Regardless of price, the name Dietzgen always identifies a greater value.

(Continued from page 294)

was included in the N. E. A. program distributed at the convention in Portland.

The program on Wednesday, which was in charge of Mr. Fred M. Groshong, of Portland, took for its general theme, "What Does Industrial Arts Contribute to Modern Education?" Dr. C. A. Howard, of Salem, Oreg., talked on the subject, "Education That Endures," and Mr. F. G. Leasure, Portland, had charge of the discussion.

The program on Wednesday afternoon, in charge of Mr. E. H. Whitney, of Portland, took up the topic, "Industrial Arts in Progressive Education." Mr. Lawrence F. Ashley, Charleston, Ill., discussed the topic "Education and Change — a Challenge" and Mr. Frank C. Moore, of Cleveland, Ohio, talked on the subject "An Integrated Program of Industrial Arts." Mr. H. C. Ruckmick had charge of the discussion.

On Wednesday evening Dr. James R. Jewell had charge of the program, which centered on the theme "The Cultural in Industrial-Arts Education." Mr. J. Leo Fairbanks, of Corvallis, talked on "Cultural Developments in the Industrial Arts" and Hon. E. C. Sammons discussed "Industry, Education, and the Arts."

More than 500 persons were in attendance at this sectional meeting, which was attributed to the publicity given to the program and the interest manifested in the subject. Considerable credit is due to Prof. George B. Cox, head of the department of industrial arts at the Oregon State College, and to Mr. Fred Groshong, supervisor of industrial arts, Portland, who were responsible for the entire program. Professor Cox arranged the program, obtained the speakers, had charge of the printing of the programs, and watched to see that the program was carried out as planned. Mr. Groshong, who was in charge of the local arrangements, planned and arranged the industrial-arts exhibits of seventh- and eighth-grade work. This exhibit was held at the Irvington School, where the luncheon and sectional meetings also were held. The material on exhibition was well displayed and served in a fine way to promote interest in industrial-arts education. — *Frank C. Moore.*

VOCATIONAL TEACHERS OF PENNSYLVANIA MEET AT STATE COLLEGE

The twenty-third annual meeting of the Vocational and Practical Arts Teachers of Pennsylvania was held July 30 to August 1, at State College, in conjunction with the Superintendents' Conference.

Mr. E. C. Hartwell, of Buffalo, N. Y., spoke on "The New Vocational Education"; Supt. Samuel Fausold, of the State Education Department, talked on "Recent Trends in Vocational Education"; and Dr. Edwin E. Lee, New York City, discussed "Types of Guidance Needed."

A feature of the meeting was the panel discussion on vocational education and practical arts, with Dr. M. K. McKay acting as chairman. Ten members representing the State Council of Education, and twelve representing the legislative committee, participated in the discussions. The study resulted in the decision that vocational education in Pennsylvania is not too expensive and that greater federal aid ought to be solicited.

The departments of home economics and agriculture also held conferences for their groups. Mr. Earl Bedell, of Detroit, discussed "The Industrial Youth Movement."

There was an attractive and instructive commercial exhibit, with displays by 22 commercial firms.

The meeting was in charge of a group, comprising Mr. L. J. Hayden, Wellsboro; Miriam Weikert, York; J. G. Allen, and S. L. Coover. — *George C. Donson.*

INDIANA INDUSTRIAL-EDUCATION ASSOCIATION HOLDS FIFTH ANNUAL CONVENTION

The fifth annual convention of the Indiana Industrial-Education Association was held March 27 and 28, in Fort Wayne.

At the convention strong sectional programs were held for each of the sections, including aeronautics, automotives, drafting, electricity, foundry and patternmaking, general shop, machine shop, printing, rural shop, and woodwork. The two-day convention offered three outstanding features. The first of these was an exhibit of industrial-arts projects contributed by the teachers from all over the state. The commercial exhibitors also were present in large numbers and contributed much to the success of the convention.

The second feature was the outstanding addresses at the general sessions by Supt. Merle J. Abbett, of Fort Wayne, who talked on "Co-ordination — Industrial Education and the Superintendent," and by Dr. M. S. Lewis, of Indiana University, who discussed "The Relation of Industrial Arts to Experimental Organizations in a School System."

A third feature was the effort made to effect a closer relationship between industry and teachers of industrial arts. This was accomplished by trips through the industrial plants in Fort Wayne and by contacting leaders in industry for prominent places on the program.

The association elected the following officers for the next year: President, Mr. David E. Sellers, Fort Wayne; vice-president, Mr. Warren A. Pease, Evansville; secretary-treasurer, Mr. H. G. McComb, Lafayette. — *Sylvan A. Yager.*

New Publications

Furnishing the Home Grounds

By Ken. F. Shepardson. Cloth, 45 pages, 6 by 9, illustrated. Price, 80 cents. Published by The Bruce Publishing Company, Milwaukee, Wisconsin.

A helpful book containing designs and working drawings for those interested in making furniture for the porch, lawn, garden, or for the grounds about the summer home. The illustrations and descriptions will assist even the beginner to produce creditable and useful pieces of furniture.

The projects described include benches, chairs, settees, tables, swings, flower boxes, trellises, arches, fences, and gates. Several designs are offered in most cases for each of the articles mentioned.

Metal Spinning

By James E. Reagan and Earl E. Smith. Cloth, 80 pages, 6 by 9, illustrated. Price, $1. Published by The Bruce Publishing Company, Milwaukee, Wisconsin.

An instructive book on an art which is again coming into prominence.

The author explains the entire process in a concise, easily understood way. Each step is illustrated either with line drawings or with halftones. There also is information regarding the treatment given the different kinds of metals, the lubricants used, and the like.

Besides the illustrations of examples of work made by early American spinners, there are 20 or more designs shown which can be produced in the school shop.

Common Woodworking Tools

By E. M. Wyatt. Cloth, 67 pages, 6 by 9, illustrated. Price, 80 cents. Published by The Bruce Publishing Company, Milwaukee, Wisconsin.

A book which will interest the woodworker. The author spent a great deal of time and energy in digging out the facts which, were it not for his industry and perseverance, might become inaccessible in a few years. The material is good related information for the student in the woodworking class. The book is well illustrated.

Wood Carving Made Easy

By J. I. Sowers. Cloth, 96 pages, 6 by 9, illustrated. Price, $1.25. Published by The Bruce Publishing Company, Milwaukee, Wisconsin.

The author, recognizing the revival of interest in woodcarving, has written a book which will prove helpful to the beginner as well as to the advanced student of an art which has been followed since prehistoric times.

He describes all of the different types of carving, shows what tools are used and how they are used, the kinds of wood the carver works with, how the design is chosen, and how the work is planned and executed. The book contains a large number of exceedingly interesting illustrations.

Summer-School Notes

STOUT INSTITUTE SUMMER SESSION

The 1936 summer session of The Stout Institute, Menomonie, Wis., opened with an enrollment of 430 students. Of these, 130 were graduate students. The students in attendance represented 26 states and Nova Scotia and a substantial increase in total attendance and in graduate attendance was reported.

The session offered a number of special conferences, conducted by such well-known authorities as Mr. George P. Hambrecht, Madison, Wis.; Prof. Howard H. Higgins, Boston, Mass.; Mr. John Callahan, Madison, Wis.; West A. Burdick, Madison, Wis.; Prof. Harold M. Groves, Madison, Wis.; Prof. J. L. Gillin, of Madison, Wis.; and Dr. No-Yong Park, of China.

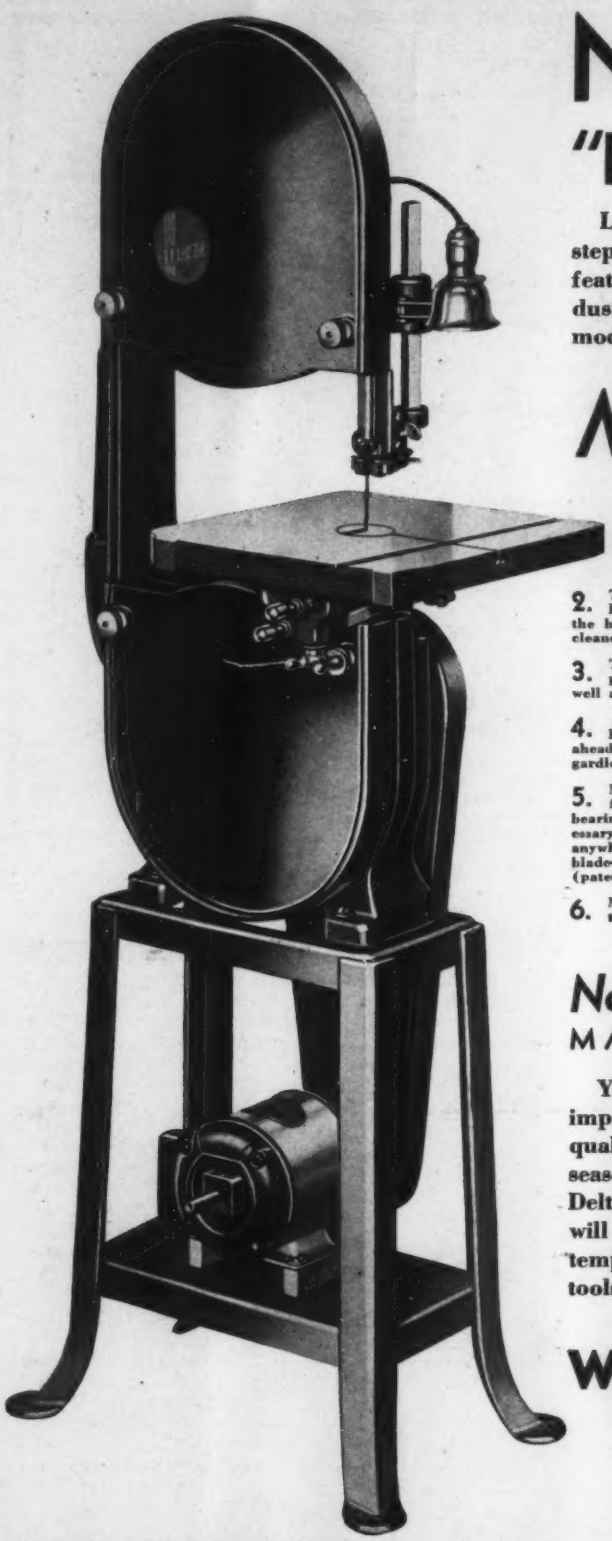
A large number of students took advantage of the opportunity for direct study in significant, current, educational-frontier fields. The short-unit program comprised such study groups as consumer education, co-ordination in vocational education, rehabilitation, curriculum construction in industrial education, survey procedure, and adult education.

OHIO UNIVERSITY SUMMER SESSION

The Sixth Annual Industrial-Arts Forum held during the Ohio University 1936 summer session, under the leadership of Dr. William E. Warner, at Columbus, Ohio, attracted from 70 to 100 students.

The program offered was unusually rich. The initial dinner program, on July 1, was

(Continued on page 16A)



New Improved "Delta" 14 in. Band Saw

Last year's Delta 14-inch Band Saw represented a distinct step forward in band saw design. It incorporated many new features that made this tool exceedingly popular with industrial training instructors. Now comes the new 1937 model with still further improvements and refinements.

Many New Features

1. The entire base has been re-designed so as to completely enclose the back part of the lower wheel in order to meet guarding requirements for schools and industrial installations.

2. The base is exceptionally heavy and hollow cast, and the rear face of the base is of pleasing design and easily cleaned.

3. The upper wheel is likewise completely guarded by a rear guard as well as by a remarkable front guard.

4. An entirely new lower guide design has been developed, placing it far ahead of anything on the market, regardless of price.

5. Micrometer screws carried to the front of the table for adjusting ball bearing guide wheel. This makes it unnecessary for the operator to bring his hand anywhere near the cutting point of the blade—a very important safety factor (patent applied for).

6. Micrometer screws are carried to the front of the table for adjusting the carriage that carries the square guide pins. (Same advantage as stated in No. 5).

7. The lower guide comes very close to the surface of the table. This is very important because it supports the blade very close to the point where the cut takes place and enables more accurate cutting and far less blade breakage.

8. New heavy duty trunnions with trunnions spaced far apart. This is a distinct Delta development for which patent has been granted. This design makes for utmost rigidity and enables the slot in the table to be placed at right angles to the wheel shaft so that the rip gage bars need not be removed and replaced again when changing blades.

9. All bearings are sealed on both sides and lubricated for the entire life of the bearing. Delta has developed and pioneered this. It means not only freedom from all up-keep and oiling, but the life of the bearings themselves have been lengthened two and three times over the old style bearings because no grit and harmful lubricant can enter these bearings.

10. Table has a groove 5/8 x 3/4 to fit the standard Delta miter gage.

New 1937 DELTA Line Out Soon

MANY NEW FEATURES—NEW TOOLS

Year after year Delta engineers continue their work of improving existing models and developing new models of quality, low-cost motor-driven tools. The coming 1937 season is no exception. Important announcements of new Delta Tools will be released shortly, announcements that will be of tremendous interest to all those who are contemplating additions to their shop. Before selecting new tools—be sure to see the 1937 Delta Line.

WRITE FOR CATALOG

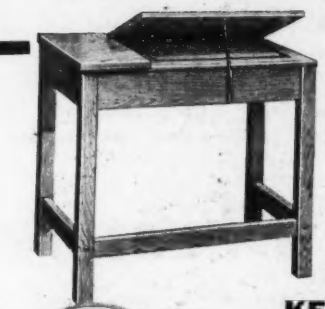
The new 1937 Delta Catalog will be off the press soon. It will contain full description, illustrations and photographs of the complete Delta Line, including the many new Delta Tools with improvements incorporated in the 1937 line.

Every man interested in low-cost, quality tools should see the new Delta Catalog. In order to make sure that your name will be placed on the mailing list to receive a copy, Write Today.

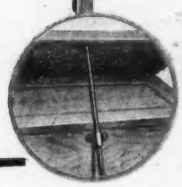
DELTA MFG. CO.

600 - 634 E. Vienna Ave. Dept. E936
Milwaukee, Wis.

NEW! Tops that Lock automatically at ANY Angle



No thumb screws, bolts or ratchet devices to adjust. No tools required to raise or lower the table top. The person using the table stands in front, raising top to desired angle by one hand.



KEWAUNEE'S NEWEST IMPROVEMENT

The Ever-Hold Support . . . an exclusive patented feature. Sets top automatically at any angle from 3 to 45 degrees. To close top, elevate to full height and rod is automatically released. This automatically adjustable support is now standard equipment on all Kewaunee Art and Drawing Tables. Write for folder.

Kewaunee manufactures a complete line of Drawing and Art Room furniture. Catalog sent free on request.

Kewaunee Drawing Table No. L-2085

Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS

Kewaunee Art Table No. L-2056

245 Lincoln St. C. G. CAMPBELL, Pres. and Gen. Mgr. Kewaunee, Wis.
Eastern Branch: 220 E. 42nd St., New York, N. Y.
Mid-West Office: 1614 Monroe St., Evanston, Ill.
Representatives in Principal Cities

(Continued from page 14A)

opened by Dr. Thomas E. French, who discussed some of his etchings exhibited at the Faculty Club and gave an interesting chalk talk on Calligraphy, illustrating it with symbols and letters from Chinese, Korean, Japanese, Egyptian, and Phoenician origins.

On July 8 there was a symposium program on "The Philosophy Chapter for the new Federal Bulletin on Industrial Arts," in which Prof. Viva Booth, Prof. Harry G. Good, Prof. Louise M. Spaeth, William H. Stone, and Herbert A. Toops participated.

The session on July 15 was devoted to the topic, "Characteristics of American Industrial-Arts Programs." Miss Louise H. Lawton presented the elementary program, Willis A. Whitehead the secondary, Prof. William D. Stoner the higher, and Mr. Roman M. Hammes talked on programs outside of the public school.

The session on July 22 was entitled "Evaluation Procedures." Mr. John R. Ludington, Dr. Ralph L. Tyler, and Dr. Rudolph Lindquist participated in the discussion.

The session on July 29 was in the form of a closing program, marking the end of the first term. At this session, Prof. Ronan, of the Department of Architecture, gave an illustrated lecture on "Interesting Artifacts," and Dr. Warner spoke on "The National Program of Epsilon Pi Tau."

The August 5 meeting centered around the subject, "Tuskegee and the Problem of the Skilled Negro," at which time Prof. George L. Washington, of Tuskegee, presented a paper.

At the August 12 meeting, Victor Bowers, Kenneth Brown, Burl Osburn, Raymond Phipps, John Whitesel, and Gordon O. Wilber discussed "Patterns of Leadership in Industrial-Arts Education."

The August 19 meeting was devoted to "American Graduate School Programs for Industrial-Arts Teachers," at which time the results of a comprehensive survey were presented and discussed by members of the Forum. These included Prof. Grinnell, Prof. Hankammer, Prof. DeWitt Hunt, and Prof. E. G. Livingston.

The meeting on Saturday, August 22 was a fitting climax to the whole program, taking the form of a day-long conference and equipment exhibit for superintendents, principals, and school-board members of Ohio, on the subject "School Shop Planning and Equipment Selection for Small Schools." An interesting laboratory planning clinic was set up for the use of superintendents of schools and shop teachers, which dealt with problems concerning the improvement of industrial-arts laboratories.

The Forum program concluded with the Annual Steak Fry, in charge of Prof. Orville E. Sink.

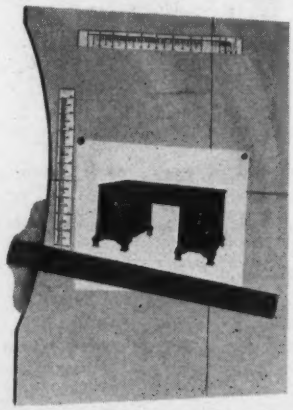
Radio broadcasts over Station WOSU were a regular feature throughout the forum sessions.

School-Shop Equipment News

PERSPECTIVE DRAWING MADE EASY

The Klok Furniture Research Institute, 430 Lyons Street, N. E., Grand Rapids, Mich., is marketing a special 18 by 24-in. sketch board which simplifies and speeds up the making of perspective drawings. Equipped with this board, perfect ovals, ellipses, and other conplicated forms can be layed out directly without tedious and slow blocking-out methods. A vertical and horizontal scale, inlaid into the board, makes measuring easy.

If desired, the firm also furnishes with this board a course consisting of 50 sketches of authentically styled pieces of furniture so that the shop teacher not only can learn how to



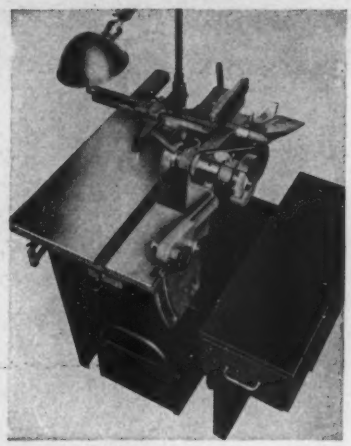
use this handy drawing board but acquires at the same time some very fine projects for his school shop.

NEW SOUTH BEND WORKSHOP LATHE

The South Bend Lathe Works, South Bend, Ind., has announced a new model 9-in. work-

(Continued on page 18A)

C & G Trade Mark



IMPORTANT FOR THE SCHOOL COMPOSING ROOM

In selecting a Saw Trimmer for school or production use be sure that it carries the C & G Trade Mark.

C & G Saw Trimmers offer the ultimate in safety, accuracy, and economy of production. There is a model to meet your requirement.

Free Catalogs show why C & G Saw Trimmers have become the favorites of hundreds of printers and publishers throughout the world. Write for your copies.

MILWAUKEE SAW TRIMMER CORPORATION
612 East Clybourn Street **Milwaukee, Wisconsin**

For Your Envelope Printing

Western States

Offers These Advantages

Felt Brush Gumming

Paper Stock to suit the Job

High Cut back fold

Deep shoulder Flap—less makeready time

Compact, deep covered, dustproof boxes

Samples and Prices Gladly Furnished.

The Western States Envelope Co.

West Pierce St. at 16th Street Viaduct
MILWAUKEE WISCONSIN

THE 3 *in* ONE AMERICAN

No. 9095 in Wood
No. 529 in Steel

SCHOOL PRESSROOM CABINET

Stock table, drying rack, ink and roller cabinet all combined into one. The American School Pressroom Cabinet economizes on space providing for efficiency and convenience.

The 30x30x1½ inch drying frames can be pulled from either side of the cabinet, enabling the feeder to work at one side, placing freshly printed sheets, while the dry sheets may be removed from the other side.

The roller compartment provides ample space for storage of rollers any length up to 31 inches.

One of the shallow drawers at the top contains a removable black-enameled metal pan and plate-glass ink mixing slab. The other drawer is convenient for tools.

Two metal-lined rag compartments round out this compact cabinet which stands 40 inches high. The stock table top measures 33¾x50⅝ inches.

In ordering specify either No. 9095 made of hard wood with flat varnish finish, or No. 529 (same design) made of steel in an olive green finish. Or, if you prefer, write for additional information.

DEPARTMENT OF EDUCATION

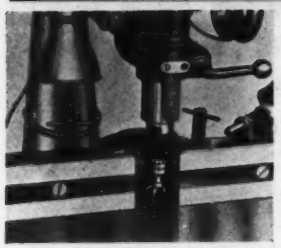
American Type Founders

200 ELMORA AVENUE

ELIZABETH, N. J.

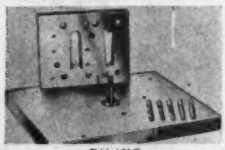
Types used: Stymie Bold and Century Schoolbook

WATCH NEXT MONTH — NEW MODELS FOR 1937!

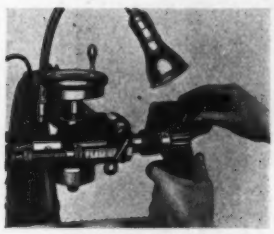


SHAPING
Shaping is an operation where the high-speed router proves its worth. The guard and guide assembly from the spindle shaper fits the jig saw blade.

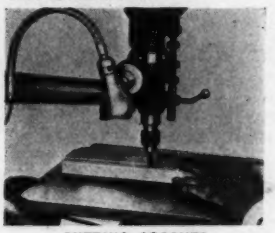
SABRE SAWING
Block letters, window displays, silhouettes easily cut out.



FILING
Accurate metal filing may be done. Bearings protected from metal particles by fabric boot.

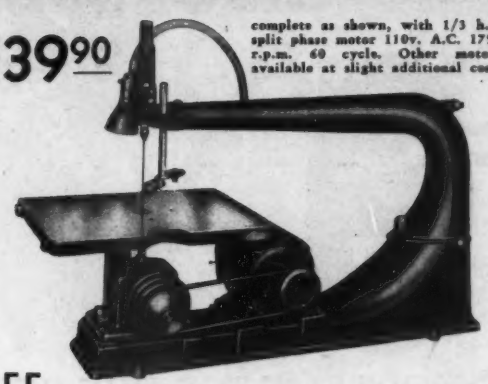


SPINDLE CARVING
For spindle carving the router assembly is swung to a position where the quill is parallel with the table and secured in that position. Then the work is held against the revolving cutter and moved about.



CUTTING GROOVES
The high speed of the router assures a smooth, even cut. In this installation the ripping fence proves indispensable. By swinging the arm to one side, extra long pieces may be grooved.

$39.90 complete as shown, with 1/3 h.p. split phase motor 110v. A.C. 1750 r.p.m. 60 cycle. Other motors available at slight additional cost.



A SAFE 24" JIG SAW—*Engineered To Do Many Jobs Well*

This is probably the safest type of power saw ever designed—for that reason, ideal for school work. Add the versatility given this tool by the addition of the RD35 Router unit (shown in use at left) and you can appreciate what a sound value it offers.

Throat capacity 24". 4½" from upper vise to table, 16" x 12½", which tilts to 45° with graduated quadrant. Blower in head. Four speeds. Arm swings to left or right. Full line of accessories available. Price of RD35 Router Attachment only, $33.50 including foot treadle, cable and pulleys. Write for complete catalog.

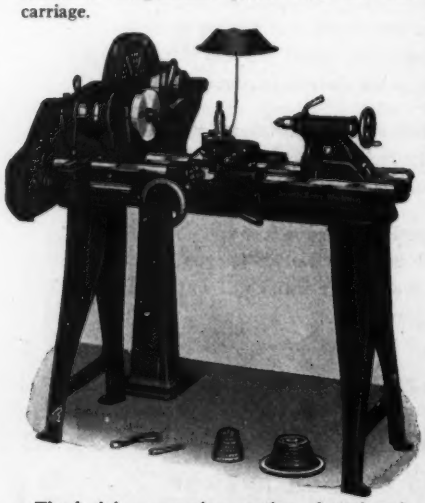
Walker-Turner Co., Inc., 1996 Berckman St., Plainfield, N. J.

WALKER - TURNER *Engineered* POWER TOOLS

(Continued from page 16A)

shop lathe, which may be had equipped with the new pedestal-type motor drive.

The 1936 model 9-in. workshop lathe features ten new improvements among which are the twin-gear reverse and right- and left-hand threads and feeds, ball-thrust bearing on the headstock spindle, larger spindle bearing adjustable for wear, improved tailstock with 5/8-in. setover for taper turning, and an automatic longitudinal power feed for the carriage.



The bed is a one-piece casting of steel and nickle iron. The lathe may be obtained with bed lengths of 3, 3½, 4, and 4½ feet. These beds have three V-ways and one flat way, accurately machined so that headstock, tailstock, and carriage are in alignment to within .001 in. The pedestal-motor-drive mechanism is a separate unit. It is available for all sizes of South Bend floor-leg lathes. The new features included in the pedestal motor drive are: motor entirely apart from the lathe, thus eliminating vibration; silent belt drive, providing a smooth, steady pull; no overhead belts to obstruct vision or to cast shadows on the work; V-belt from motor to drive pulley enclosed with guard; screw-type belt-tension adjustment; and a belt-tension release for shifting belt to change spindle speeds.

The pedestal motor drive has a three-core headstock providing six spindle speeds ranging from 39 to 630 r.p.m. The lathe cuts screw threads from 4 to 40 per inch. Fine-screw-thread cutting attachment also is available which increases the threading-cutting range to 80 per.

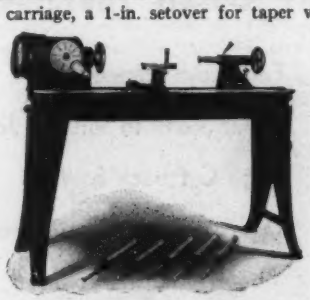
This new pedestal motor drive with its convenient sizes and surprisingly wide range of adaptability, can be obtained at a very reasonable cost.

NEW OLIVER METAL-SPINNING LATHES

The Oliver Machinery Company, Grand Rapids, Mich., announces a new line of metal-spinning lathes which embody a number of advanced features. These lathes are rigid, accurate, and easy and safe to operate and will give years of accurate, trouble-free service. They are used for spinning sheet metal—copper, bronze, brass, aluminum, German silver, galvanized iron, pewter, and the like. They can be had in the following sizes: 12 by 48, 16 and 20 by 72, and 24 by 84 in.

These spinning lathes are equipped with ball-bearing variable-speed unit-type motor-driven headstock which can be adjusted to any speed from 800 r.p.m. to 2,400 r.p.m. These headstocks also have substantial thrust ball bearings so that they are able to withstand heavy constant pressures.

The 12-in. spinning lathe has a 3 h.p. motor for 2- or 3-phase 60-cycle 110-220-volt circuits. The tailstock is secured to the bed by a positive lever clamp. The tailstock spindle has a traverse of 4 in. and on lathes with carriage, a 1-in. setover for taper work.



A set of 5 spinning tools, consisting of a beading tool, a cut-off tool, a flat-nose tool, a narrow flat-nose tool, and 1 round-point tool, are included with the lathe. These tools are about 2 ft. long, with conveniently shaped wood handles.

REMCO MOTOR DRIVES

The Manley Products Corporation, York, Pa., advises that they have just installed 17 new Remco direct motor drives in the machine shop of the high school at Laconia, N. H. In this way, the shops of the school will be quieter, safer, and less costly to maintain.

The schools at Pottstown and Hanover, Pa., also have recently modernized their school shops by equipping certain machine tools with Remco motor drives.